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SOLID WASTE MANAGEMENT: ABSTRACTS FROM THE LITERATURE, 1967

Franklin Institute Research Laboratories

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SOLID WASTE MANAGEMENT

Abstracts from the Literature

1967

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Abstracts from the Literature—1967

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THE SOLID WASTE MANAGEMENT BIBLIOGRAPHIC SERIES
1941 – 1971

Since its beginning over a quarter century ago, the Federal program in solid waste management has had a number of organizational aegises, as well as several organizational titles. One constant, though, has been quite visible throughout the program's development, and that is its unflagging interest in bibliography.

Collecting past data on a problem by a literature search is the classic first step used in the scientific method of problem solving. Thus, in 1941, the first workers in the Federal program searched the world-wide literature for information that had been published on solid wastes. The resultant bibliography was then published as a service to other workers in the field and became a periodic publication in the Public Health Service series. This step was taken again in 1965, following the passage of the Solid Waste Disposal Act, when the early bibliographies were reprinted and made more widely available. The literature search was then extended through 1971, and the present bibliography is one of those that will bring the series up to date.

--SAMUEL HALE, JR.
Deputy Assistant Administrator
for Solid Waste Management

SOLID WASTE MANAGEMENT

Abstracts from the Literature

1967

The Solid Waste Disposal Act of 1965 (Public Law 89-272, Title II) and its amended legislation, the Resource Recovery Act of 1970 (Public Law 91-512, Title I), authorized collection, storage, and retrieval of information relevant to all aspects of solid waste management.

Although the literature represented by this bibliography does not include all the solid waste literature published in 1967, numerous periodical and nonperiodical titles covering both the foreign and domestic literature were screened for inclusion. No effort was made to separate strictly technical material from that which is more general. The bibliography is arranged in categories corresponding to the various administrative, engineering, and operational phases of solid waste management. Indices include subject, corporate author, author, and geographical location cited. Addresses of periodical sources are provided.

This project is the result of the combined efforts of the Solid Waste Information Retrieval System (SWIRS) and the Franklin Institute Research Laboratories under contracts PH 86-67-182 and PH 86-68-194. Primary SWIRS personnel involved in this project were John A. Connolly and Sandra E. Stainback.

--THOMAS F. WILLIAMS, *Director*
Technical Information Staff
Office of Solid Waste Management

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LAW/REGULATIONS

67-0001
Amendment proposed to Solid Waste Disposal Act. Refuse Removal Journal, 10(11):24, Nov. 1967.

Senate Bill 1646, introduced April 27, 1967, is discussed. As an amendment to the Solid Waste Disposal Act, it would permit the Secretary of Health, Education, and Welfare to make grants to State, interstate, municipal, and intermunicipal agencies, as well as to organizations composed of public officials which are eligible for assistance under sections of the Housing Act of 1954. The amendment would allow the federal government to pay up to two-thirds of the cost of a single municipality's study and three-quarters of the cost for a study of more than one area.

67-0002
American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. 346 p.

The program featured discussions of: Federal, State, and local problems involving beautification; aesthetic concepts in community development; recognition of aesthetics as a public purpose; common law nuisance doctrine; enabling legislation; and recent legislative approaches. Other topics covered are: the use of police power and eminent domain in achieving aesthetic goals; non-governmental programs involving beautification; valuation problems involving aesthetic control; techniques of conveying differing rights; effect of aesthetic land use restrictions on marketability; the tax aspects of aesthetic enhancement; the developing jurisprudence of aesthetics; planning and zoning, with special emphasis on the local level; the future of aesthetic control; and an extensive review of current literature in the field. Numerous citations of court decisions dealing with the legal concepts and issues of aesthetics are included.

67-0003
Atherton, E. B. Valuation problems involving aesthetic programs. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.112-126.

Some basic rules and prerequisites of evaluation which govern the acquisition of property for aesthetic purposes are discussed. The prerequisites are: understanding of State and Federal laws and obtainment of necessary legal counsel; obtainment of necessary easement of cost to procure particulars from administrative or engineering personnel; and determination of highest and best use from individual data and judgement. Supplementing the 1965 Highway Beautification Act, the Federal Highway Administration has issued Policy and Procedure Memorandum 80-9 entitled 'Acquisition Procedures for the Control of Outdoor Advertising Signs and Junkyards, and for Landscaping and Scenic Enhancement.' Signs and junkyards lawfully in existence as of Oct. 22, 1965, must be appraised, acquired, and paid for, or otherwise controlled by negotiation and payment of just compensation to each interest. The fee simple estate, cost to cure, leasehold estate, and the leased fee estate as applied to appraisals and scenic easements are discussed. The maximum compensation for both the landowner and the sign owner may not exceed the capitalized economic rental value. Valuation of junkyards as presently practiced is discussed in depth.

67-0004
Billett, J. D. Nuisance doctrine. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.72-86.

The nuisance doctrine is classified, defined, and discussed along with citations of many court cases. The courts generally recognize that the States and municipal governments could not only suppress nuisances which were denounced by the common law, but also could specify legislatively what shall be deemed a nuisance so long as its determination is not arbitrary or capricious. However, even though the States and local governments have a wide discretion in declaring certain conditions to be public nuisances and may add to the common law a list of nuisances, they cannot under the guise of the police power abate that which is not in fact a nuisance. Instead of the health, safety or morals aspect, upon which the doctrine of nuisances was initially based, some courts have recently been able to sanction abatement of land uses which have merely impalpable harmful effects on the surrounding areas. Because of its drastic nature in the elimination of non-conformity as nuisance, other approaches may be preferable and should be considered thoroughly at the time legislation is being considered.

67-0005

Bosley, J. J. Legislative needs for a metropolitan solid waste disposal program. In L. Weaver, ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.61-63.

The cooperation of local jurisdictions is essential for an effective metropolitan disposal program. Existing legal authority for such cooperation in the Washington, D.C. area is described. But, the problem cannot be solved with the existing legislation. Some legal alternatives for the Washington area are discussed, e.g. a nonprofit corporation composed of the local governments and a metropolitan authority.

67-0006

Court decision may affect U.S. landfill regulations. Refuse Removal Journal, 10(5):23, May 1967.

The Superior Court of San Mateo County, California, found 'that the proposed use (by Sanitary Fill Company) of the Sierra Point site as a garbage disposal area (for San Francisco's wastes) is a public nuisance.' If this precedent is allowed to stand, it could, by its influence, mark the end of every fill and refuse disposal operation in the country.

67-0007

Court forbids price fixing. Refuse Removal Journal, 10(7):32, July 1967.

The Department of Justice has filed a judgment in the U. S. District Court of Philadelphia forbidding seven former or present officials of the Pennsylvania Refuse Removal Association to fix prices or restrain trade, or to be either officers or directors of any trash association for 5 years. During a 3-week trial in 1964, the Antitrust Division of the Justice Department charged several members of the Association with meeting as early as 1960 to make agreements not to solicit customers from each other. The present judgement concluded the civil antitrust suit against the Association.

67-0008

Disposal damage ruled a tax loss. Refuse Removal Journal, 10(2):34, Feb. 1967.

Damage by a garbage disposal may be classed as casualty loss for income tax deduction in the same category as storm, shipwreck, or fire.

67-0009

Dunham, A. Preservation of open space by private arrangements. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.95-99.

Laws have been passed authorizing various agencies of government to acquire absolute or limited interest in land not to be used directly by the public, in order to preserve open space, scenic beauty, or other aesthetic values in our society. Yet, many people are involved in political, educational, and legal campaigns to pressure the legislative bodies to exercise their power to permit the use of open space for other competing purposes which are admittedly in the public interest such as school buildings, bed for a highway, museums, stadiums, convention halls, fire houses, and police stations. A well rounded program on the legal problems of open space should include considerations of the legal techniques to preserve the victory in hard won battles for open space. A case in point involves the area known as Grant Park, and its ramifications are discussed. The basic law of private property or the law concerning easements and how it can be applied to perpetuate open spaces is discussed. Through the use of the rights of private property, many people with little or much accumulated wealth can benefit their fellow men.

67-0010

Farr, F. S. Posies, politics, and the courts. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.283-292.

Efforts to conserve and protect the natural resources of our country involve the administrative, legislative, and judicial branches of our government at all levels—local, State, and national. Historical instances and court cases dealing with these efforts are discussed. The Highway Beautification Act of 1965 aims to impose controls on outdoor advertising, to hide ugly junkyards visible from the road and to enhance the scenic beauty of the highway. By far the most controversial part of the Act is Title I relating to outdoor advertising. The Act exempts on-premise point-of-purchase signs. These comprise 90 percent of the urban billboards. There are some 839,000 signs of all sizes and shapes and description far removed from commercial or industrial activity of any kind. These are signs which clutter up the rural roadside and uglify many natural areas. The Act provides for a penalty of a reduction in a State's Federal highway allotment by 10 percent for not complying with the billboard or junkyard provisions of the Act. The Act is not effective until 1970 and the Act provides for true negotiation and formal agreements between the individual States and the Secretary on size, lighting, and spacing of billboards, and the definition of an unzoned industrial or commercial area where outdoor advertising is permitted. The Secretary may suspend the imposition of the penalty when he deems it to be in the public interest.

67-0011

Gooder, D. M. Brakes for the beauty bus. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.127-149.

The inherent problems in governmental intrusion into the area of beautification and aesthetics are discussed. Aesthetic goals can best be achieved by voluntary techniques that involve, in part, governmental cooperation. Various court cases are cited where aesthetic considerations may or may not provide the sole support of a police regulation. There are substantial differences in court attitudes toward police power and restrictions on private property in the various States. It is clear that the courts are aware of the dangers involved in permitting government to rule in the aesthetic field. The techniques of 'amortization of non-conforming uses' relating to land and structures of various States is discussed, and court decisions are cited. Compensation is not the whole question involved. The use of governmental power to its fullest constitutional extent is advocated by some, and all other considerations are brushed aside. Over the past 10 years there has been a growing concern among members of Congress as well as government officials and others with regard to whether the persons and businesses which are being displaced have been required to bear a disproportionate share of the burden of these federally assisted programs. It is clear that the question in connection with governmental programs whether for beautification or otherwise, is not fully resolved by answering the question of whether to compensate or not. A serious question remains as to the items of damage for which compensation will be paid. These 'incidental' items are listed and discussed.

67-0012

Herrmann, C. Using research experimentation to improve the urban environment. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.254-262.

The experiment involves the development of a new research method for studying human reaction to the urban freeway, with particular emphasis given to the roadside environment. The study was limited to a consideration of the urban highway as seen in motion. The input was a series of slides shown in sequence so that the viewer had a feeling of being driven on the road. The slides were shown for 5 to 10 seconds each with a similar interval in between. The observer saw slide sequences of: the route as it is; the route with large signs removed; the route with utility poles removed; and the route with both large signs and utility poles removed. The results of the test, theoretical findings, practical findings, observer evaluation statistics, and the bipolar adjective factor are discussed. Two observations are offered: first, it has been possible to work effectively on a complex problem of urban visual environment under controlled laboratory conditions; and secondly, the synthesis of several research methods on the problem of human response to the urban roadside has produced some interesting, new insights at both the theoretical and practical levels.

67-0013

Johnson, R. R. Recent legislative approaches are enabling legislation to accomplish aesthetic objectives. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.29-71.

A discussion in depth is presented on: current scope of aesthetic controls; government control of private land use; and aesthetic objectives and public purposes as related to legislative programs. Legislative programs fall into three main categories. The preservation of open spaces, protection of the highway, and land use controls based upon aesthetic considerations are defined and discussed. Through the use of a State's police powers, the so-called 'greenbelt zoning' technique has been used by some States to protect open space. Taxing methods, zoning ordinances, and various approaches to preserve open space are outlined. Comments are made on the Highway Beautification Act as passed by Congress in 1965, and its effects on land use controls are discussed. Outdoor advertising and junkyards have long been the primary targets for control based upon aesthetic considerations. The passage of this Act has had far reaching effects on junkyards. A list of references, conclusions, and an appendix are presented.

67-0014

Johnson, R. R. The jurisprudence of aesthetics. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.327-346.

In the early development of our legal system simple rules emerged from the common law which placed restraints upon the inherent sovereign police power. Such a rule was the one against aesthetics, which provided that 'aesthetic considerations alone are not sufficient to sustain a restriction upon the use of property.' This simple formula was a check against arbitrary government power. Court cases involving this rule are cited. Once it became accepted as part of the responsibility of the law to see that private land uses which conflict with the welfare of the community as a whole did not occur, court decisions began to refine the role of aesthetics under the police power and to place new importance on the concept of 'general welfare.' While aesthetics alone would not justify an exercise of the police power, it could be given some weight in conjunction with upholding the legislation on grounds of safety, health, morals, or welfare. Commencing in 1963, three State supreme courts ruled squarely on this question and upheld the control of land use on aesthetic considerations alone. If the point is ever reached where aesthetic factors constitute a legal force, the courts will be faced with the question of whether a particular police power regulation is a reasonable means of achieving the goals of preserving amenities in community development or whether the restriction amounts to an arbitrary standard of community taste or preference.

67-0015

Jurisdiction of garbage removal: sanitary district or village? Public Works, 98(6):84, June 1967.

Incorporated Village of Atlantic Beach v. Kimmel, 223 NE 2nd 489(N.Y., 1967) was an action by the village for a declaratory judgement, establishing that it has sole and exclusive power and jurisdiction to provide for the collection or removal of garbage within its territorial limits, while also restraining the defendants (Sanitary District Commissioners) from providing for such collection and disposition after the existing contract expired. The plaintiff village insisted that any contract the sanitary district might sign for the period after the present contract expires, should exclude the plaintiff village. The court recognized that practical difficulties are likely to be encountered in the case of sewer, water, or other improvement districts which, by their nature, are required to function as units. However, the court held that the village was empowered to render garbage disposal services and to contract for such services upon expiration of the contract which had previously controlled the garbage removal.

67-0016

Kentucky adopts incinerator laws. Refuse Removal Journal, 10(12):36, Sept. 1967.

Kentucky's Air Pollution Control Commission has adopted strict regulations to give its staff more enforcement powers regarding incinerator design and specifications. Minimum construction criteria for incinerators, emission of air contaminants, and regulation of open burning are included in these regulations.

67-0017

Kratovil, R. Aesthetics and the marketability of title. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.247-253.

Various court decisions are cited in regard to aesthetics within the ambit of public interests that are accorded legal protection under the police power in an affluent society. Whether junkyards or billboards become unlawful as a result of the exercise of the police power without compensation, or under the power of eminent domain with payment of just compensation, is a matter that deeply concerns the landowners and industries involved. A substantial encroachment on adjoining land by a substantial building renders title to both tracts of land unmarketable but when the building that encroaches on neighboring land is old or dilapidated, or a temporary structure of small value, or a structure that is removable at only slight effort or expense, the title is deemed marketable. However, if there is no unlawful structure on the land, but the land is subject to some valid, prospective police power enactment forbidding future use of the land for billboards or junkyards, it would not appear necessary to mention these enactments in a contract of sale. Laws that have not been violated do not render title unmarketable. It is reasonable to assume that the existence of any record of a scenic easement, whether acquired by purchase or by condemnation, must be shown on any future contract of sale, or else the title will be deemed unmarketable.

67-0018

Leverich, R. C. The preservation of scenic beauty—one way to get there. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.151-158.

Simply stated, the program involves selecting scenic areas carefully, evaluating their beauty potential and obtaining those land use rights which will enable preservation, restoration, or enhancement of the potential. The easement program is workable and there can be great benefits in this type of program. The easement program provides for continued useful land use by owners. The true objective of this program is not to deprive owners of usable, marketable property merely for the convenience of agencies unwilling to assume a cooperative relationship with owners. There is no merit in a preservation program which does not provide for the fullest possible utilization of beauty. Some of the problems encountered are: failure to provide leadership; failure to provide positive thinking; and valuation problems. There is much confusion associated with valuation problems on a scenic easement parcel and these problems are outlined and discussed. Three suggestions are presented for the appraisers: understand the objective of the program; remember the definition of fair market value and highest and best use; and use common sense and good judgement and negotiate settlement if necessary.

67-0019

Levin, D. R. Review of current literature. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.308-326.

A review of a selected group of available documents relating the legal elements of aesthetics is presented. It provides an excellent background for the formulation of legal inferences and the analysis of legal issues. Some of these will supply the data needed to support assertions of various kinds involving the aesthetics subject matter. The bibliography includes such subjects as: general books, demand, protection and/or enhancement, programs, benefits—economic impact standards, complementary facilities, existing scenic roads and parkways, Federal agency activities, financing, legislation, planning and research, and maps and guides.

67-0020

Lewis, P. H. Environmental awareness. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.100-111.

Topics under discussion are: environmental patterns, human impact, human needs, inventory tools, and awareness centers. A variety of choices is both possible and necessary for the intelligent allocation and utilization of the resources found in the natural environment. With this awareness the time has come for a second look at our basic landscape resources. The following environmental factors are outlined and discussed: weather, toxic patterns, fire hazards, floods, disease vectors, cropland, scientific patterns, landscape personality, ethnic patterns, environmental corridor patterns, individual resources and resource nodes, potential reservoirs, utility and transportation, human waste and disposal, aquifer recharge, ground water, building materials, and volcanic earthquake patterns. Techniques must be developed for presenting these environmental studies to the general public in conceptual and pictorial form. Until clear pictures and concepts about man and his environment, the problems, and potential and causal relationships are disseminated and become part of the common stock of knowledge, there can be little progress in guiding human impact in harmony with identified natural and cultural value patterns.

67-0021
Litter detectives catch the guilty. Refuse Removal Journal, 10(7):36, July 1967.

Three detectives in St. Louis sifted through litter on vacant lots in order to find names and addresses on cartons, advertising materials, sales slips, etc. Last year they came up with 780 cases of illegal dumping and found the guilty party in 152 of them. Illegal dumping of trash and refuse is a violation of a city ordinance and the violator is subject to a fine of $1 to $500, or 90 days in jail, or both, on conviction.

67-0022
Litter law tidied by Minnesota bill. Refuse Removal Journal, 10(12):18, Dec. 1967.

Faced with a multitude of laws that provide capricious penalties for convicted litterers, the State Assembly has passed a bill providing uniform penalties for all types of littering, namely, from $10 to $200 in fines, imprisonment of up to 30 days, or both. The State Senate conservation committee has unanimously approved the bill.

67-0023
Montano, J. M. Problems in condemnation of property rights involving aesthetic controls. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.213-229.

The program to keep America beautiful or to restore its beauty is being concentrated along the routes of the Interstate Highway and primary highway systems. The program concentrates on three methods: control of outdoor advertising, control of junkyards, and preservation of areas by the acquisition of scenic easements. Questions arise as to whether or not this program can be carried out by the use of police power, the exercise of the power of eminent domain, or a combination of the two. There are also questions of whether or not the power of eminent domain could be used for the control and preservation of aesthetics. After the condemnation suit is filed, these issues may have to be resolved: is the purpose for the taking or limitation of the use of property for a public use; is there a necessity for the taking or limiting of the use of the property in question; and have bona fide negotiations, where required by law, been conducted and concluded by a failure to agree upon the compensation to be paid for the taking or damaging of a property right. Bona fide negotiations generally fall into two general classes: what constitutes an attempt to purchase; and with whom must negotiations be conducted. Two rules are most commonly used for measuring compensation: the measure of compensation is a difference between the value of the entire property before taking and the value of the property remaining after the taking; and the compensation is equal to the value of the land taken plus the difference in market value of the remainder before and after the taking. Just compensation shall have to be determined and paid when either relocation, removal, or disposal becomes necessary and is done so under the exercise of the power of eminent domain. Citations of various court cases are presented.

67-0024
Mullen, B. J. Scenic easements: techniques of conveyancing. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.230-246.

Some techniques of conveyancing through condemnation and variances relating to scenic easements are discussed. Wisconsin, for a number of years, has been buying scenic easements for the purpose of improving the scenery along its highways. The fee title concept as practiced is discussed, along with its recent changes and the various legal problems encountered. To solve the problem, a rather simple one-sheet easement conveyance was prepared and is presented. Wisconsin has a 'quick take' eminent domain law and about 25 percent of the scenic parcels have been acquired to date by condemnation. The 'excess' disposal procedure, as involved in the easement conveyances, when employed for minor right relinquishments, as in the case of a scenic right, is time-consuming and a nuisance to undertake. As a result, a bill is being proposed to grant authorization to the State Highway Commission to grant variances or release of conditions without having to follow the burdensome 'excess' disposal procedure. The terms of the proposed bill are included, as are scenic easement forms.

67-0025
Netherton, R. D. Federal, State, and local programs for beautification. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.159-178.

The following topics are discussed: the public character of present beautification programs; inventorying beautification programs; neighborhood beautification; community beautification; open space and park lands; and fragile properties. Generally, the Federal role has been one of providing incentive through promulgation of national policy, technical assistance, and financial help through the technique of grants-in-aid. This Federal activity has been and will be the source of a much more extensive set of programs by State and local governments. The most successful Federal aid programs have been those which have left the choice of means for accomplishment of objectives to the States and localities. There are many instances where the private citizen, acting alone or with his neighbors, can and should take the initiative in promoting amenity and the aesthetic values of his environment. The public, through its governmental agencies, is the major owner of land in the nation. The Federal Government owns 22 percent of the land in the 48 contiguous States and one-third of the land on a 50 State basis with Alaska and Hawaii included. Add to this the lands owned by State and local government, and various special purpose agencies, and one begins to see how the programs which manage these land resources can indeed affect man's environment. Various agency programs have been instituted as a means of conservation and beautification and these programs are discussed and appended.

67-0026
Netherton, R. D. Police power vs. eminent domain. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.1-22.

The concepts and issues of police power vs. eminent domain in relation to the legal limits, policy limits, and combinations of the two are discussed. In any discussion of police power and eminent domain for aesthetic purposes, there emerges an interplay between the two approaches on the question of when to pay and when not to pay. One point of view seeks a definition of the ultimate limits of the State's constitutional power to regulate land uses. The other viewpoint stresses the policy decisions which seek to do what seems fair and sensible for both the public and private interests in an affluent society. Both view points are needed for balanced equitable and imaginative handling of aesthetic programs. The interests of the public are served best by selective use of eminent domain along with land use regulation so that amenity and natural beauty in the environment can be developed with other resources. It is hoped that when the choice between police power and eminent domain is made, it is done with care and candor, so that it will clarify rather than obscure the evolution of the law.

67-0027
New York to set junkyard controls. Refuse Removal Journal, 10(8):56, Aug. 1967.

A law to regulate junkyards and scrap-metal processing facilities within 1,000 ft of its major highways has been passed by the New York State legislature. Regulations will be established by the State Superintendent of Public Works by January 1st. New York would lose $28 million in Federal highway funds if such regulations are not adopted.

67-0028
Northern Virginia Regional Planning Commission. Legal aspects of junk auto disposal. Falls Church, Va., May 1967. 39 p.

This study is concerned with the legal aspects pertaining to junk cars in the various jurisdictions of the Northern Virginia Region, including the removal of such vehicles from both public and private property, and the subsequent handling of the cars on the way to their intended destination, the scrap processor. Legal means employed or proposed by other governmental jurisdictions are explored. Conclusions are that existing provisions which are available under Virginia law present a broad and solid basis for the effective removal of junk and abandoned motor vehicles from both public and private property. The timely disposition of junk and abandoned motor vehicles after removal is hampered by the 60-day waiting period. Local and regional junk automobile collection points, established with coordinated planning, could serve for the removal and disposition of junk cars within an orderly scrap cycle. The junk automobile problem should be presented to the Virginia Advisory Legislative Committee so they can study it and recommend legislation to the General Assembly. Once the General Assembly has enacted enabling legislation, model ordinances should be formulated for the guidance of the local governing bodies of Virginia.

67-0029
Northern Virginia Regional Planning Commission. Removal of junk cars from public and private property; procedures after removal of junk cars. In Legal aspects of junk auto disposal. Falls Church, Va., May 1967. p.3-13.

Sheriffs, police officers, and other officers are directed by Virginia law to pick up and store any 'motor vehicle, trailer or semitrailer, or part thereof' found unattended and hazardous to traffic on the highways. Such removal is reported to the Division of Motor Vehicles and to the owner of the vehicle, who can get possession of the vehicle upon payment of removal and storage costs. The State law further provides that local governing bodies may adopt ordinances for the removal and disposition of any 'unattended or abandoned' vehicle from both public property and privately owned property when it constitutes a traffic hazard. The legal problems connected with the handling of abandoned cars removed from both public and private property in Northern Virginia are beset with time-consuming procedures required by law and administrative regulations. Recently a 1966 amendment to the Virginia Law has permitted a 90-day statutory waiting period to be reduced to 60 days and authorizes the sale without advertising of the junking of vehicles of an appraised value of less than $50. However, all vehicles, including the junked ones, must still be held for the full 60 days. A concentrated effort should be made to get junk cars completely out of circulation and converted to scrap, rather than permitting them to get into the hands of purported users. This often results in the same car being impounded several times.

67-0030
Northern Virginia Regional Planning Commission. General observations concerning Northern Virginia; what others are doing to solve the problem. In Legal aspects of junk auto disposal. Falls Church, Va., May 1967. p.13-27.

Outlying areas of Loudoun, Prince William, and Fairfax Counties are victimized by automobile hulks left near isolated farm houses by parties unknown and known, who have taken the more valuable parts for their own use and for sale in the Washington area where prices are higher. It is suspected that many of these cars are brought down from the Washington area where compliance with zoning and other ordinances prevents their abandonment. There is little incentive financially for property owners to remove junk cars from their premises and deliver them over to a scrap processor. New Hampshire has a motor vehicle junkyard law, which is primarily an act to license and regulate auto wrecking yards. In 1963 the District of Columbia gave the Metropolitan Police Department the job of collecting and disposing of junk vehicles. An estimated 15,000 junk cars have been removed from private property in the District since the removal program began. A new approach to the problem of cleaning up automobile junkyards was proposed to the Maryland State legislature in 1967; its provisions would require dealers to dismantle old automobiles within 6 months of acquiring them and dispose of the bodies or pay a tax of $20. In 1965, the legislature of the State of New York enacted a general law in relation to the regulation of automobile junkyards, declaring that 'a clean, wholesome attractive environment is of importance to the health and safety of the inhabitants.'

67-0031
Northern Virginia Regional Planning Commission. Application of the law in general. In Legal aspects of junk auto disposal. Falls Church, Va., May 1967. p.27-33.

There are two basic methods of imposing controls over accumulation of junk automobiles: 'zoning' and 'licensing'. These methods of control are derived from the police powers which may be delegated by the State legislature to local municipal and county bodies. Some municipalities have attempted to prevent location of automobile wreckers, scrap dealers, and junkyards by prohibiting, through zoning ordinances, their location within the jurisdictional limits. In some States, zoning ordinances include a time limit on the operation of automobile scrap yards in order to give the operators sufficient time to amortize their investment in the enterprise. Some State legislatures have delegated to counties, cities, and towns the power to license junkyards and impose reasonable standards for their operation. The licensing method can be used to regulate existing junkyards, whereas zoning cannot affect their operation. Licensing regulations can also require the licensee to maintain his premises in a safe condition free from hazard to health. Enforcement responsibilities over automobile junkyards have been vested in different levels of government. The jurisdictions in the Northern Virginia Region have available to them a wide variety of legal tools which may be used in removing and disposing of abandoned and junk automobiles. Among these are zoning, policing, and licensing ordinances. In addition, local governmental jurisdictions can look to their charters for added authority for coping with their specific problems concerning abandoned and junk cars.

67-0032
O'Harrow, D. Planning, zoning, and aesthetic control. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.293-307.

There are three types of action we can use in reaching the objective of making our nation and its cities more beautiful. We can eliminate, we can preserve, and we can create. There is considerable difference between the elimination of ugliness and defining beauty as the absence of ugliness. The problem here is defining ugliness. The successful campaign to rid the territory of Hawaii of billboards used the very simple and unambiguous principle, 'billboards must go'. The implied definition is that beauty is a landscape without billboards. Aesthetic control is land-use control, and land-use control ordinances have been recognized as laws that can be unnecessarily harsh on individuals. Thus, they are generally unsatisfactory. The program of aesthetic control can be attained by the use of a variety of devices: calling on public purchase, both of fee titles and development rights; using eminent domain where necessary; using tax concessions and tax penalties; and eventually using the police power through more strict zoning and development control.

67-0033
Oregon institute urges waste laws. Refuse Removal Journal, 10(12):44, Dec. 1967.

State Senator Cornelius Bateson of Oregon, principal sponsor of State legislation to govern the collection and disposal of solid wastes, considers that solid waste control will be a pressing problem in Oregon in the near future. He cites packaging of consumer products, increased industrial wastes, population increases, and land shortage as reasons for action on solid waste control legislation. The new Oregon Solid Waste Division of the Oregon Sanitary Service Institute will start hearings preparatory to issuing State regulations on solid waste disposal.

67-0034
San Francisco crisis reborn with filing of $4.6 million suit. Refuse Removal Journal, 10(12):14, Dec. 1967.

In November, Brisbane voters approved a 5-year extension of the landfill operations by Sanitary Fill Company. A new suit has now been filed by 46 Brisbane citizens which asks for both preliminary and permanent injunctions against the disposal of San Francisco's refuse within the Brisbane municipality's borders. It seeks $50,000 actual and $50,000 exemplary damages for each of the 46 plaintiffs. The City of San Francisco, Sanitary Fill Company, Golden Gate Disposal Company, and 50 individuals have been named as defendants. Furthermore, a plan to erect an incinerator in San Francisco is veiled in possible complications. The site preferred by the contractors is near a Pacific Gas and Electric plant, but in an area slated for redevelopment. The local Redevelopment Agency will not have a plan ready until December 1968, and there is no assurance their plan will include the projected incinerator site. The Bay Area Air Pollution Control District, fixed on developing its own pilot model incinerator, has refused to give any advance endorsement either.

67-0035

Seaborg, G. T. Testimony. In Establish a select Senate committee on technology and the human environment. Washington, Government Operations Committee, Subcommittee on Intergovernmental Relations, U.S. Senate, Mar. 20, 1967.

Dr. Seaborg presented to a Senate subcommittee a talk concerning the technological-environmental relationship. Our basic environment has not changed much since man began inhabiting the earth, but we have changed and with little regard for our environment. We are polluting our atmosphere with 125 million tons of particulate matter each year. Per capita production of solid waste has risen from 2.75 lb per day in 1920 to more than 5 lb per day at this time and is increasing at an average rate of 5 percent per year. Our modern technology has been the cause of most of our pollution problems. While extremely efficient at converting natural materials, technology has overlooked the necessity of reconverting the waste into usable, nontoxic materials. As technology has created the problem, it is for technology to solve it. It is indicated that cybernetics and nuclear power are two very important tools in controlling our environment and examples are given of what future accomplishments might be made in these areas of research.

67-0036

Searles, S. Z. Aesthetics in the law. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.263-282.

The law of aesthetics has been developed over the years through the exercise of the police power and the power of eminent domain. The police power utilized in zoning cases recognizes that restrictions may be imposed upon the individual in order to benefit the general welfare, health, safety, or morals of the whole community so long as the restriction is reasonable and is neither discriminatory nor arbitrary. Numerous court cases are discussed to indicate when police power, as distinguished from eminent domain, becomes unreasonable and burdensome. Earlier courts considered aesthetics outside the scope of the concept of public use in eminent domain. However, courts later began to change their attitude recognizing the social values inherent in aesthetic considerations. The device known as the scenic easement is receiving more and more attention at the present time. Through the use of the scenic easement, public acquisition of an interest, in the nature of a negative easement preventing development, is obtained while ownership of the fee remains undisturbed. However, in some cases where the burden would be too much on the property owner, the whole fee is taken. The law of aesthetics is becoming more important today than it has been in the past. The courts have come to the realization that the aesthetic factors previously considered outside the context of public use are equally as important as other factors, not only in connection with values but also with the public health and welfare.

67-0037

Split $500 daily in illegal payments. Refuse Removal Journal, 10(1):10, 38, Jan. 1967.

Eighteen men were suspended from New York's Sanitation Department, charged with having split up to $500 a day in cash payments from private contractors who dumped at a city-owned marine transfer station. The scheme cost the city $350,000 a year and had continued since 1949. The investigation began September 1966. Private contractors are supposed to buy city dump tickets from the Sanitation Department to turn in when they use the city's disposal facilities. Besides often paying for half the refuse dumping, which runs between $6 and $28 depending on truck size, the contractors were also allowed to dump their refuse when the station was closed to others. A wholesale work slowdown was averted when Uniformed Sanitation Association president John J. DeLury and Commissioner Kearing smoothed differences that were created by these discriminating practices. The Commissioner has joined with the president to see that all contractors will be treated fairly in the future.

67-0038
State court rules in dumping case. Refuse Removal Journal, 10(3):26, Mar. 1967.

Demolition material discarded by a contractor is classified as refuse and must be dumped in assigned areas in Massachusetts.

67-0039
Sues for private contracting rights. Refuse Removal Journal, 10(7):20, July 1967.

Superior Court in Seattle has ruled that the owner of a three-unit apartment building has won the right not to pay for a city refuse collection service which he did not require, and has issued an injunction restraining the city from imposing refuse collection fees on the plaintiff. Under the terms of a contract with private haulers, the City of Seattle is obliged to pay them for collection from all residential buildings of less than five apartments, while owners of larger houses can make their own arrangements for removal. This owner had spent about $3,000 to provide a chute-type system in his building to eliminate use of refuse cans, and the container he installed was approved by the city's Building Department. He had then contracted privately for removal by a private disposal firm and held that the municipal ordinance was 'unreasonable and discriminatory' since it required him to pay fees to the city for removal.

67-0040
Train, R. E. The law and the environment. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967. p.87-94.

The Conservation Foundation is discussed. The conservationists' new and highest priorities are no longer confined to wildlife, forests, and productive land, but are turning to deprived environments such as polluted air and water, ugly physical surroundings, absent play areas, and noise. Thus, conservation is suddenly becoming 'people oriented'. Conservation is defined as the rational use of the physical environment to promote the highest quality of living for mankind. Conservation usually involves conflicts of interest. Law can provide orderly and effective processes whereby conflicts of interest in making choices can be resolved in the best interest of society as whole; can provide the means of establishing and protecting the public interest in resources; and can become an instrument whereby ecological principles and conservation values can be translated into guidelines and directives for effective social action on behalf of environmental quality. The incredibly complex overlapping political arrangements constitute a major obstacle to environmental quality in this country. Communications between agencies are often minimal or non-existent. Highways, parks, zoning, sanitation, public housing, air, and water pollution abatement, are cases in point.

67-0041
Trash battle leads to death. Refuse Removal Journal, 10(2):10, Feb. 1967.

One man in Dallas, Texas, reported another to police for emptying a pickup truck full of refuse near his home. Since he was fined $20, he returned to the informer's home and shot the informer nine times and killed him. The informer's son shot and disarmed the second man.

67-0042
Tunnard, C. Notes of the lack of aesthetic principles as a guide to urban beautification. In American Bar Association National Institute; Proceedings; Junkyards, Geraniums, and Jurisprudence; Aesthetics and the Law, Chicago, June 2-3, 1967.

The present approach to environmental aesthetics is discussed. These ideas are incorporated in the following over-all concepts: the principle of orderly grouping in the regulation of the placing of high rise buildings and other tall structures; the extension of the viewing perimeter; the preservation and rehabilitation of whole urban districts; and the reestablishment of the concept of the shared environment. The age of the 70's and 80's cannot afford to be the age of clutter. Proliferating autonomous agencies such as parking and housing authorities, and even baseball park authorities will not be able to deal with the new ways of living together in the city that society will have to devise.

Architectural control works well in established areas. A great lack in the field of aesthetic interest is technical knowhow. There is a lack of controlling ideas in the area of urban aesthetics.

67-0043
Two indicted for bribery in N.Y. sanitation scandal. Refuse Removal Journal, 10(5):48, May 1967.

Vincent Starace and Frank J. Scarpinato, former ranking employees in New York City's Sanitation Department, were indicted on charges of conspiracy and taking $25,000 in bribes to promote employees to high-ranking posts.

67-0044
U.S. Congress, Senate. Air Quality Act of 1967. Amending the Clean Air Act as Amended. Report of the Committee on Public Works to Accompany S.780. Report 403. Washington, U.S. Government Printing Office, July 15, 1967. 86 p.

The need for legislation, the legislative history, and hearings on the problem of air pollution are reviewed. The major provisions of the bill (S. 780) to amend the Clean Air Act are reported: authority for the Secretary of Health, Education, and Welfare to set ambient air quality standards and go to court to enforce any violation of standards; designation of air quality regions; publication of information on the control technology required to achieve air quality; an expanded research program and grants for controlling pollution from fuels and vehicles, and planning for intrastate air quality standards; Federal preemption of the right to set standards on automobile exhaust emissions; establishment of a President's Air Quality Advisory Board; Federal assistance to the States to develop motor vehicle emission and device inspection systems; cost analysis of the effects of air pollution control. A section-by-section analysis of S. 780 is followed by a comparison with existing provisions of the law and changes in the existing law.

67-0045
Use State weight and length laws as guide for trailers. Refuse Removal Journal, 10(4):40, Apr. 1967.

New truck trailer weight and length laws in many States allow transport firms to step up capacity from four-axle tractor semi-trailer units to five-axle rigs and to double bottoms in the West and Midwest. Semi-trailers 40-ft long may be hauled throughout the United States.

67-0046
Vaughan, R. D. Assistance available under the Solid Waste Disposal Act. In L. Weaver, ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967, Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.155-166.

The Solid Waste Disposal Act of 1965 is explained. Several examples of work done under grants from the Solid Wastes program are described. The Act provides aid for demonstration projects, State survey and planning projects, research projects, and training of personnel. The program also provides technical assistance for public and private agencies. Future plans and proposed legislation are discussed.

ECONOMICS

67-0047
Combustibles cost double. American City, 82(11):39, Nov. 1967.

Costs for collecting and disposing of combustible material in Kenosha, Wisconsin, are almost twice those for noncombustible material. All combustible material goes to the incinerator, except when collections run considerably above normal or when the furnaces are under repair. During 1966 the city crews collected 12,698 tons of combustible material. The total cost of collection, including incineration, labor, gas, oil, and repairs on equipment, amounted to $23.96 per ton. Incineration alone averaged $3.56 per ton. During the same period of time 15,703 tons of noncombustible material was collected. Residue from the incinerator brought the total of noncombustibles to 19,277 tons for the year. Total cost for collection and disposal, including landfill maintenance, gas, labor, oil, and repairs on equipment, came to $12.53 per ton. Landfill alone averaged 68 cents per ton. The number of employees and the equipment available to the Kenosha Waste Division is outlined.

67-0048
Contractor granted annual rate review. Refuse Removal Journal, 10(3):26, Mar. 1967.

Refuse collection rates in Bremerton, Washington, are going up 12 1/2 cents monthly bringing the basic rate up to $1.72.

67-0049
Financing water, sewage, and solid waste disposal. Public Works, 98(10):174, Oct. 1967.

Amendments to Act 185, P. A. of 1957 have made available to Upper Peninsula (Michigan) communities a new way to finance water, sewer, and garbage disposal systems. These amendments authorize Upper Peninsula counties to establish departments and boards of public works for the purpose of providing the services named to the residents of a county. The more important facts incorporated in the amendments are listed. Conditions under which open dumps or modified open dumps are permitted to operate are specified in Act 87.

67-0050
Milwaukee pushes disposal planning. Refuse Removal Journal, 10(6):32, June 1967.

Milwaukee County may issue revenue bonds to purchase disposal sites and build incinerators if a bill recently introduced in the State legislature passes.

67-0051
New collection system bills Illinois residents directly. Refuse Removal Journal, 10(10):36, Oct. 1967.

Normal, Illinois, recently put a new refuse collection system into effect for its 14,000 residents. A local firm provides contract pickup service, and the householder will be billed directly for the service, along with water and sewage charges. Each resident will be charged $1.30 per month for each unit and the full cost for pickup and dumping of refuse will total $59,300 for this fiscal year. Businesses, apartment and rooming houses, trailer courts, schools and churches are not included in the general residential contract. Refuse pickup is at curbside with an extra charge being levied for backdoor pickup.

67-0052
Presuhn, A. Cost problems with waste incinerator plants. Brennstoff-Waerme-Kraft, 19(10):489-492, Oct. 1967.

A method for separating the costs involved in the waste incineration from the total costs of a combined waste-coal incinerator plant designed to produce electric energy and to supply heat to remote apartment houses, is demonstrated at the power station Nord in Munich. A separate cost calculation is indispensable for economic operation of the plant. To obtain the investment and operating costs for the waste incineration alone, the total costs of the entire plant have to be determined and the share the waste incineration takes in it calculated. This is best done by assessing the additional costs involved in the construction, maintenance, etc. of the facilities for the waste incineration. A difficult problem in the cost calculation is the determination of the economic value of the waste. The heating value of the waste and the scrap contained in the waste represent an economic value. To find the economic value of the waste, the heat consumption per kwh of a modern power station without waste incineration is compared to the heat consumption per kwh of a power plant utilizing waste incineration. The difference between the two values is the primary energy inherent in the waste used for energy production. The proceeds obtained from the sale of the scrap together with this difference value constitute the economic value of the waste. For better illustration of the cost calculation a numerical example is given. (Text-German)

67-0053
$7,684,409 is bid for Seattle area. Refuse Removal Journal, 10(10):20, Oct. 1967.

The low bid for collecting refuse in Seattle's North End was the General Disposal

Corporation's bid of $7,684,409. This is about $3.6 million under that rendered by the holder of the present contract. The new agreement covers the years 1968 to 1972. The low bid of $5,688,839 for the South End collection originated from the present contract holder, the National Disposal Contractors, Inc. The combined bids exceeded by about $239,000, the estimate made by a consulting firm retained by Seattle to examine refuse collection.

67-0054

Suburbs urge user tax for incinerator. Refuse Removal Journal, 10(7):32, July 1967.

West Allis, West Milwaukee, Wauwatosa, and South Milwaukee are fighting the proposed financing of a $5,500,000 incinerator by general obligation bonds. This incinerator is the first phase of an incinerator program for Milwaukee County. The suburbs argue they would have to pay taxes for the new incinerator which they will not use, as three have their own, while West Milwaukee contracts with West Allis. The four suburbs prefer that the county issue revenue bonds under which the incinerator would be financed by the users.

STORAGE

67-0055

Buehler, W., and P. J. Proc. Experience with waste containers made of low-pressure polyethylene. Staedtehygiene, 18(10):236-241, Oct. 1967.

Waste containers made of low-pressure polyethylene were subjected to tests for resistance to heat, corrosion, fire, etc. In a heat chamber the containers endured a temperature of 125 C for 24 hr without losing their shape. No mechanical stress was applied. A burning cigarette thrown into an empty container melted the surface of the wall but was not capable of burning a hole or igniting the material. Wind resistance was tested. Empty containers flipped over at a wind velocity of 45 km per hr (wind intensity 6), full containers at 95 km per hr (wind force 10.5), showing that the containers are an easier prey to the wind than tinned sheet steel containers. The containers withstood about 2,000 tiltings without wear and tear. The noise made by plastic containers filled with glass bottles on a shaking table was much less than for tinned sheet steel containers. The containers are quite resistant to weather conditions. Containers placed in solutions of high molecular phenol derivatives, formaldehyde, chloride containing insecticides, and highly active wetting agents, showed no damage whatever. (Text-German)

67-0056

Ecke, D. H., and D. D. Lisdale. Fly and economic evaluation of urban refuse systems. Part I. Control of green blow flies (Phaenicia) by improved methods of residential refuse storage and collection. California Vector Views, 14(4):19-27, Apr. 1967.

Green blow fly production from household garbage containers and the density of adult green blow flies in four comparable areas of 500 homes each in Santa Clara, California, were compared. Traps collected all fly larvae migrating from 40 representative garbage containers in each area. Adult fly density was determined at 20 standardized attraction stations. It was found that control must be evaluated in terms of total fly production as well as frequency or distribution of fly sources. Using these criteria, tabulated data showed the following results: once-a-week metal cans--extremely high production from about 67 percent of containers; once-a-week paper bags--high production from about 10 percent of the containers; twice-a-week paper bags--no containers with consistently high production. The study further showed that mixed refuse containers are independent fly sources with little or no dependence on nearby sources as to their productivity.

67-0057

Flamm, H., and M. Rotter. Comparative experimental investigations of steel trash barrels and paper garbage bags. Staedtehygiene, 18(2):39-45, Feb. 1967.

Four series of experiments, performed in 1965-1966 in Vienna, Austria, were aimed at determining advantages and disadvantages of paper waste bags over steel trash barrels. The steel and the paper containers were each charged with 10 kg vegetable garbage and 10 kg boiled beef skull bones, and were placed side by side in a sunny corner of a back yard. The tests lasted from 12 to 26 days. At three different points inside the containers temperatures were measured and recorded. The temperatures in the paper bag were consistently below those in the steel container. While considerable rotting and many flies were found in the steel container, the material in the paper bag was only slightly rotted, and only a few flies were present. Also, it was substantially dryer. This was caused by both capillary action through the paper and evaporation and subsequent diffusion through the paper wall. This was confirmed by charging the containers with agar and placing them in a room with controlled temperature and humidity. After three weeks the agar in the steel container and in a paraffinated paper bag had lost about 10 percent of its weight while the agar in an untreated bag had lost 50 percent. Other advantages of the paper bags are lightness, less noisy handling, and no necessity for specially designed garbage collecting vehicles. The fire hazard often mentioned is not serious since people using the bags will naturally be more cautious with hot ashes. Seven diagrams illustrate the measured temperatures and weight losses. (Text-German)

67-0058

Flintoff, F. The problem of the city centre. Public Cleansing, 57(6):297-298, June 1967.

Since many buildings have no provisions for refuse storage and removal, redevelopment is necessary. The period of storage at the primary point in the building would normally be short and transfers to main storage would take place at least daily and often more frequently. The distance between these two points should be short and passenger lifts should not be used. The storage area should be on the ground floor. Trailers (over 20 cu yd) and proprietary containers (8 to 16 cu yd) are satisfactory and economical for removal of refuse from the storage area. Any 'on-site' disposal methods must be judged by certain standards. It must be free of dust, noise, and odor, child and animal proof, and present no fire risk. Efficiency is more important than cost.

67-0059

Haher, K. The art of storage management. Modern Maintenance Management, 19(4):26-28, Apr. 1967.

The efficient storage of cleaning equipment and materials is discussed. It is stressed that good design of the storage area promotes maximum utilization of space. Heavy equipment should be readily accessible and shelves that can sustain weights of from 200 to 300 lb will prove most beneficial in maintaining an orderly storeroom. Proper care of equipment, cleanliness, good lighting, and temperature control, as well as intelligent inventory control, all contribute to successful storage management.

67-0060

Improvement in the collection of waste through plastic containers. Wasser und Abwasser, 108(30):861, July 1967.

Waste increases with standard of living. In Hamburg between 1952 and 1966 the population increased by about 30 percent; the amount of waste by 300 percent. The packing material for food and other daily required products makes up a good deal of the accumulating waste. In the age of oil and remote heating systems, domestic incineration no longer exists. The conventional material used for waste containers is tinned sheet steel. A 110-liter container of this material weighs about 25 kg; the waste in it often weighs much less. In cooperation with waste container manufacturers, the chemical industry has developed a container of low-pressure polyethylene, combining high mechanical strength and resistance against weather and chemical substances in waste. Containers come in sizes of 110, 70, 50, and 35 liters, shaped to fit the tilting devices of commonly used waste removal trucks. (Text-German)

67-0061

MacKay, D. Challenge of a new town. Public Cleansing, 57(5):261-270, May 1967.

East Kilbride, one of the most modern towns in Britain, is faced with many problems. The paper sack system of storage and collection of refuse has been introduced. The system was given consideration because: (1) The system requires less personnel. (2) Sack holders were provided by the Development Corporation. (3) The town lay-out was ideal. (4) The initial pilot scheme proved that there would be a substantial saving. For future use, tipping areas were surveyed and the problem of installation of incinerator on-site units at multi-story buildings was considered. Since anti-litter campaigns and sweepers have not been successful, litter is still a major problem. In the discussion which followed, Mr. J. R. Bonser spoke on the problems encountered when two old boroughs and one new one formed London Borough of Waltham Forest. Mr. W. Lewis spoke on the public cleansing service in a new town. Other questions brought up concerned a waste paper salvage scheme, litter problems, dustbins, legislature concerning wastes and fees.

67-0062

McCarthy, F. S. Lightweight bins and dustless loading. Public Cleansing, 57(3):129-134, Mar. 1967.

The weight and volume of refuse continues to increase; the former in the region of 2½ percent, and the latter, 6 percent per annum. Therefore, it seems more advantageous to replace the 2½ cu ft steel dustbin with a 3¼ cu ft plastic bin. It not only holds more but is also easier and safer. These new bins have been introduced in the new dustless refuse collection system at Birmingham, Westminster, Borough of Marylebone, Bangor, and Oldbury. These bins: reduce fly nuisance; prevent spillage; provide permanently covered storage; and reduce noise. The cost of the plastic dustbin is higher than the steel--82s 6d compared to 70s 7d—but as more are purchased the price will go down. New collection vehicles with closed bodies that are accessible only through shutters have been designed. Through studies in the City of Westminster, it is apparent that the labor cost of operating the dustless bin system has been no greater than for conventional bin methods.

67-0063

Midland Centre see, hear about, and speak about bulk containers. Public Cleansing, 57(9):460-461, Sept. 1967.

Powell Duffryn Engineering Company, Ltd., showed a film to the Midland Centre of the Institute of Public Cleansing and the Midland Centre of the Association of Public Health Inspectors detailing various methods of bulk loading of refuse. The film showed various types of containers being used for refuse removal in a number of large towns and in docks. It further illustrated how the bulk container system could be applied to street cleansing by using bulk containers as temporary depots for the storage of street sweepings. W. P. Warren of Powell Duffryn discussed in detail the merits and economics of bulk container systems and pointed out that one system comprising a total of £8,000 capital together with one man only, could in one year comfortably undertake the collection of 25,000 cu yd of refuse at a cost per cu yd of 3s 6d, equivalent to only 3½d per standard 2-1/2-cu-ft bin. Other advantages of the system are that there is a minimum of floor space used at the generating point, no auxiliary labor is required, and the capital investment at each generating point is minimal. The film and prepared talk were followed by a discussion period.

67-0064

New regulations mean changes in refuse storage. Public Cleansing, 57(4):210, Apr. 1967.

The habit of markets of throwing refuse in the street must be stopped. The director of cleansing of Westminster will supply each stall with paper sack containers and will site, within the market, Dempster containers of 12-cu-yd capacity into which the stallholders can dispose of their refuse sacks. The container could be picked up, hauled, and dumped by the same vehicle.

67-0065

94% vote ‘aye’. American City, 82(7):78-79, July 1967.

About one-third, or 1,300 families, of the residents of Barrington, Rhode Island, began to dispose of household refuse and garbage in specially treated paper refuse sacks as part of a three-phase study financed by a grant from the U.S. Public Health Service. The community is required to keep accurate records of its operations and experience with the sack system. After nine months experience with the system the following observations have been made: the refuse sack system brings significant savings in time; less spillage occurs at the truck and blowing of trash and dust is substantially minimized; and 94 percent of the householders favor the sack system. One problem encountered with the system is animal depredation. When phase II of the experiment begins on July 1, 1967, another 2,000 families will join the experiment. The holders will then be slightly modified as to animal guard, and the bags will be stronger, and more moisture- and grease-resistant, particularly around the seams. The final and third phase is slated to begin July 1, 1968. At the end of the experimental period, the town will decide whether to adopt and finance the system.

67-0066

Pingen, I. Plastic sacks--a Dutch view. Public Cleansing, 57(11):595-598, Nov. 1967.

After a discussion of the disadvantages of the various refuse containers used at present in Holland, the advantages of the plastic bag both to the public and to the collection service are listed: (1) Large amounts of refuse can be stored if sufficient bags are in stock. (2) The filled bags can be fully sealed. (3) Only the disposable, light bag has to be placed on the pavement, rather than a heavy bin which must be brought back into the house. (4) The refuse bin stays clean. (5) The work is lighter and the handling easier for collectors. (6) Loading is dust-free. (7) There is greater productivity per collection unit. (8) Important economies are achieved on the repair and purchase of refuse bins. Research conducted during recent years has produced a bag which, with a minimum thickness of material, provides sufficient strength that the full bag can be removed from the refuse bin and transported. Several requirements for a good bag are listed, as are some of the disadvantages of the plastic bag which are, however, considered minor.

67-0067

Plastic liners now in use in Lebanon, Ohio, collection. Refuse Removal Journal, 10(3):32, Mar. 1967.

Plastic refuse can liners are reducing collection time from 12 to 20 percent and loading time 20 percent in Lebanon, Ohio, where they are now in voluntary use. Their use will become mandatory when voluntary use reaches 75 percent. An experiment was conducted with a letter of instruction sent to the 550 customers who were to participate. A packet of bags was tossed to the front doors like newspapers. The liners are moisture proof and prevent can soiling and rusting. The customer 'twist-ties' the plastic bag which he places at curbside.

67-0068

Public acceptance of refuse sack system grows with experience. Public Works, 98(11): 91-92, Nov. 1967.

The new refuse collection system, using paper sacks for refuse disposal and storage in Tecumseh, Michigan, is described. Before initiation of the new system, municipal garbage collection was not compulsory and many of the residents hauled their own refuse to the city dumps. With the prohibition of open dumps, a sanitary landfill operation was started and municipal refuse collection became compulsory. Residents are charged $15 per year for once-a-week pickup at the back door. This charge includes 50 paper sacks per year. Additional sacks are available at 30 cents each. Both the collectors and the present contractor are staunch supporters of the paper sack system. Collection is considerably faster and neater, and offers several advantages at the landfill site, such as neater disposal and faster settling. The residents at first were definitely against the system, but experience with it has considerably reduced complaints.

67-0069

Refuse sacks perform indoors. American City, 82(11):39, Nov. 1967.

The St. Regis Paper Company's sack refuse-disposal system has been selected for all rest rooms in State buildings in Milwaukee. Twenty-one 100-A type steel cabinets enclosing the sacks accumulate more than 500 lb of refuse daily. The sacks hold 50 percent more material than the conventional 20-gal containers, therefore requiring less frequent servicing. The steel cabinets have self-closing covers that keep odors in, and since they are gasketed for a tight seal, fire that starts inside will soon extinguish itself for lack of oxygen. The new system requires only half the time for servicing as was required with the circular containers, and the paper sacks have also solved the spillage problem at the loading bay.

67-0070

Report of a British committee investigating waste removal methods. Staedtehygiene, 18(12):293, Dec. 1967.

Upon conclusion of its investigations, the British government-appointed committee on waste removal methods published its report under the title 'Refuse Storage and Collection'. The committee urged reforms of the waste collecting and disposal methods in almost all municipalities, and suggested the use of waste paper bags and standardized dust-free waste collecting trucks. According to the committee, the waste paper bags have a number of advantages. They are hygienic, lightweight, economic, and can be handled quietly. The committee suggested that the Public Health Act of 1936 be amended by law to require the use of refuse paper bags. (Text-German)

67-0071

Rogers, P. A., and G. J. Bellenger. Fly and economic evaluation of urban refuse systems. Part II. An efficiency analysis of paper bag containers. California Vector Views, 14(5):29-36, May 1967.

An economic evaluation of once-a-week garbage can service, twice-a-week garbage can service, once-a-week service from suspended paper bag containers, and twice-a-week service from suspended paper bag containers was conducted in this study. Four comparable areas of approximately 500 homes each, one for each of the four systems studied, were selected in the City of Santa Clara. Evaluation was based on a time and motion study which compared the various aspects of pickup service between each of the four areas. Up to 30 percent savings in manpower was achieved by substituting paper bags for metal cans; but unless the collection system was actually designed around the paper bag concept, the savings in time would probably not be sufficient to pay for the additional cost of the paper bags.

67-0072

Sanitary trash container. Rohr-Armatur-Sanitar-Heizung, 22(9):722, Sept. 1967.

The firm Hausrat-Import introduced a plastic trash container whose lid opens by stepping on a pedal. Inside there is a roll installed with 20 disposable waste bags which are torn off to line the container. (Text-German)

67-0073

Schulz, H. The waste paper bag: its advantages and functions within a waste-collecting system geared to sheet and plastic containers. Staedtehygiene, 18(10):234-236, Oct. 1967.

Waste paper bags have been in use in Hamburg, West Germany, for about 6 years and their light weight has proved to be a great advantage, simplifying waste collection and making it less hazardous to personnel. Burdensome cleaning, which is necessary when sheet steel or plastic containers are used, is eliminated. Waste paper bags can be removed noiselessly and dust free. Fewer personnel are required since one man is capable of removing about 200 to 250 full bags within 9 hr, which is about double the amount in cubic meters that can be removed with sheet steel containers. The higher amount of waste accumulating during holidays can be easily handled by paper bags by simply compressing the waste a little bit, a procedure that could not be done with sheet steel containers because emptying would be hampered. Also, less sophisticated waste removal trucks are required. The great obstacle which prevents the wider use of paper bags lies in the fact that in the larger cities the waste collecting system using sheet steel containers has been so well established that a switchover to paper bags would involve high cost. However, the waste paper bag can be used in households to collect excess waste accumulating during holidays, in hospitals where the hygienic requirements lead to a need for frequent waste disposal, and in areas where waste has to be carried down steep ramps or staircases. (Text-German)

67-0074

Schwarzbach, F. Further practical experience with waste paper bags. Staedtehygiene, 18(4):85-91, Apr. 1967.

In a continuation of a previous article (Staedtehygiene 1966, No. 6) the various advantages of waste paper bags are stresed. Waste paper bags make waste disposal more hygienic, dust free, and noiseless. The bags are easy to handle and no special trucks are required for transporting them away. No cleaning or exchange and return of containers is necessary. The price of one bag, which fluctuates between DM 1 and DM 1.50, seems to have been accepted by most people. The dealer's margin per bag lies between 15 and 25 Pfennig. The municipality sells them to retailers for 80 to 85 Pfennig, a price which covers the costs of transportation, storage, and waste removal. In households the paper bag is used chiefly for the disposal of extra amounts of waste which accumulate during holidays. However, bottles pose a problem since they break and rip the bags. Most of the waste baskets along highways have been replaced by waste paper bags. A simple ring fixed to a pole holds the bag. For hospitals, a movable fixture is available into which the bags may be hung. (Text-German)

67-0075
Sells residents paper sacks for household garden waste. Refuse Removal Journal, 10(8):46, Aug. 1967.

Dundee, Scotland, sells paper sacks to householders for collection of garden refuse. The cost, 21 cents per sack, covers the cost of the sack, collection, and disposal. Over 8,000 have been sold in the last 9 months. Local authorities anticipate including the collection of garden refuse as part of their service if a report of the Working Party on Refuse Collection suggests it. Pulverization is also being considered for overall disposal. Dundee is changing over to large-capacity compaction vehicles instead of the non-compression types used previously.

67-0076
St. Louis studies container system. Refuse Removal Journal, 10(6):43, June 1967.

St. Louis is studying replacement of cans or drums by 1-cu-yd containers—steel plate boxes on wheels with doors on top.

67-0077
Suburb prohibits 55 gallon drums. Refuse Removal Journal, 10(1):37, Jan. 1967.

Residents of Hazel Crest, Illinois, will be fined $5 to $200 per day if they do not replace the 55-gal drums with receptacles 20 to 30 gal in size and fitted with tight lids. Storage of old furniture, bundles, branches, or paper on private property is prohibited.

67-0078
Urge householders use plastic sacks. Refuse Removal Journal, 10(2):32, Feb. 1967.

Officials in Bellaire, Texas, estimate that refuse collection labor costs can be cut 20 percent if plastic sacks are used throughout the community. Sacks cost about 10 cents each.

67-0079
Versatile holder for refuse sacks. Public Cleansing, 57(11):583. Nov. 1967.

A new and versatile sack carrier has been put on the market recently. The design of the carrier enables the unit, which is illustrated, to hold various diameter disposal sacks both of paper and plastic with a simple, but efficient fixing arrangement. The unit is constructed of robust steel galvanized to B.S.S. and is fitted with a rigid plastic lid. The free standing unit can be supplied assembled or dismantled for economic storage. A wall mounting type can also be supplied and each model can be protected if required.

67-0080
Waste can snuffs flames. Modern Maintenance Management, 19(3):43, Mar. 1967.

When a fire starts inside this waste paper container, the combustion products rise toward the domeshaped cover and are trapped underneath. Oxygen is kept from entering the container and the fire is immediately suffocated.

COLLECTION AND DISPOSAL–General

67-0081
Ames, J. Public cleansing in Czechoslovakia. Public Cleansing, 57(2):110-112, Feb. 1967.

Even in the smallest towns the Continental system of refuse storage and collection is in operation, with vehicles fitted with compaction devices used to reduce bulk and provide an economic payload. Most of the vehicles are badly battered. Although the refuse contained a high degree of ash and was very dusty, the employees have no overalls. Refuse from large towns is taken to a large 'factory' or incinerator, where it is incinerated after the extraction of metals. All organic matter is processed and made into manure. Refuse from small towns is usually taken to an old quarry. Many women are employed as street cleaners. Czechoslovakian roads are in very poor condition and curbs are found only in large towns. Most medium-size towns are the hub of the market for nearby farmers who bring in their cattle, poultry, etc. to sell. Public conveniences, therefore, are not up to the general standard of sanitation. Both soap and disinfectant are scarce.

67-0082
Amount of refuse collected in England and Wales. Public Works, 98(3):86, Mar. 1967.

The total weight of refuse collected and disposed of by local authorities in England

and Wales in the 1963 to 1964 period was approximately 15 million tons, representing some 100 million cu yd. These figures are included in a report of a study by the Institute of Public Cleansing which appeared in the English publication, Public Cleansing. Production of refuse has increased from 1.75 to 2.1 lb per person per day over the past 12 years.

67-0083

APWA Congress, 1967. Public Cleansing, 57(12):659, Dec. 1967.

The 73rd annual meeting of the American Public Works Association in Boston, which was attended by just under 6,000 delegates and over 200 exhibitors, is described. Exhibits in the public cleansing field ranged from paper sacks and bulk containers to pulverizers and water-cooled furnaces. There was also a model of a Rail Haul project, a study sponsored by the APWA Research Foundation, the New York Central Railroad, and the Solid Waste Program of the U.S. Public Health Service, based on transfer stations with compaction devices, railhaul, and sanitary landfill. The congress sessions relating to public cleansing were, for the second year in succession, organized by the Institute for Solid Wastes. The topics discussed included the evaluation of refuse handling systems, the use of paper sacks for refuse collection, compaction achieved in sanitary landfills, studies and attempts to regionalize refuse disposal in various States in the United States and in and around metropolitan Toronto, the pros and cons of waste heat recovery from the incineration of refuse, and the progress on a selection of studies sponsored by the USPHS Solid Waste Program.

67-0084

Arnst, F. An illustrated report on the INTAPUC exhibition. Staedtehygiene, 18(10):246-255, Oct. 1967.

The INTAPUC (International Association for Public Cleansing) exhibition was held in Paris. The variety of waste collecting trucks, waste containers, hydraulic waste presses, waste crushers, street cleaning vehicles, sweepers, etc., was great. Brief descriptions of the objects on display are given, together with 38 photographs. Special mention must be made of the rubber waste containers displayed by a French company. The containers are heavier than those made of plastic but they are very sturdy and noiseless in handling. (Text-German)

67-0085

Arnst, F. New developments in departments for municipal street cleaning and garbage collecting. Staedtehygiene, 18(6):135-139, June 1967.

The City of Freiburg i. Br., West Germany, streamlined its municipal street cleaning department and its trash collecting operations. Thus the city was able to improve its budget over a period of four years from an annual deficit of 745,000 DM to a surplus of 587,000 DM, with the greatest savings realized in wages. The work force could be reduced because the trash collection operation was speeded up and improved by replacing the steel trash cans with 35-liter plastic trash cans. Public acceptance of the plastic trash cans was excellent, especially since they are cleaned monthly by a special municipal cleaning truck. The trash is dumped in layers over an area which is not usable agriculturally and which is subsequently planted with poplar trees. Recently the city started to build up a 60 m high hill of trash which will be used as a fog-free helicopter airport. Its runway will be 1,000 m long. Street cleaning operations have become less costly since large containers were located below street level in several places throughout the city. Street cleaning machines dump the trash into these containers which are then picked up by special trucks with lifting devices. Standardization of trucks and machines has reduced their maintenance costs. In the future, an electronic data processing center will monitor all municipal operations and do all bookkeeping. The example of Freiburg may not be directly applicable to other cities but can serve as a model. (Text-German)

67-0086

Binnewies, F. W. Solid waste handling by Federal installations. In L. Weaver, ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.41-43.

Most of the waste collected in the National Capital Parks is burned in incinerators or dumps operated by the District of Columbia or other municipalities. Over 300,000 cans of trash were collected in the National Capital Parks in 1966. A current problem is disposal of trees with Dutch Elm disease. A control for the disease is being sought and trees affected are burned. The National Capital Parks spend about $500,000 annually for sanitation and $200,000 for Dutch Elm disease control.

67-0087

Bjoerkman, A. Soviet streets are the cleanest. American City, 82(6):102-103, June 1967.

There is an absence of packaging in the USSR, but the main reason for clean streets is public discipline. Soviet authorities will post names, photographs, and addresses of offenders. Soviets use flushers. Manual street cleaning is done by women who use birch brooms. Refuse has low paper content and averages 20 lb per cu yd. There is separate collection of raw garbage for animal feeding. There are refuse chutes in newer houses in the outer districts. Garbage is not wrapped because of paper shortage. The Soviets use sanitary landfills mostly but are developing composting plants.

67-0088

Black, R. J. Solid wastes handling. In Environmental aspects of the hospital. v.2. Supportive departments. Public Health Service Publication No. 930-C-16. Washington, U.S. Government Printing Office, 1967. p.20-27.

In this guide for developing environmental control programs in the modern hospital, the responsibilities of supportive departments are given special attention. The principal types of solid wastes found in a hospital are: garbage, paper, trash, and other dry combustibles; treatment room wastes; surgery wastes; autopsy wastes; and noncombustibles such as cans and bottles. Average weight and volume of solid wastes have been estimated as between 7 and 8½ lb and about 0.7 cu ft per patient per day. Adequate facilities for handling wastes include: waste chutes; waste rooms; on-site incineration; hauling for off-site disposal; waste containers and carts; garbage grinders; and storage rooms. Personnel performing collection, storage, and incineration work should be trained in protective techniques necessary for the proper handling of pathogenic wastes, medicines, empty containers with residual hydrocarbon products, and trash saturated with inflammable liquids.

67-0089

Bremser, L. W. Solid waste disposal study for the Washington metropolitan area. In L. Weaver, ed. Proceedings; Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.25-33.

Results of a 1965 study jointly sponsored by the Northern Virginia Regional Planning Commission, the Metropolitan Washington Council of Governments and the Maryland National Capital Park and Planning Commission are presented. Collection can be handled on a local level, but the lack of adequate facilities and space for disposal is a problem for every jurisdiction in the region. Landfill and incineration needs for various areas are briefly discussed. Landfill methods are suitable only in Prince Georges, Charles, Fairfax, and Prince William counties. Refuse quantities for the various counties are given and projected for 1980 and 2000. A table gives projected minimum and maximum landfill requirements for areas in the region. Potential disposal sites are discussed. Since adequate sites are scarce, any suitable land should be acquired as soon as possible. Transportation of solid wastes is also briefly discussed.

67-0090

Cleansing in Cherbourg. Public Cleansing, 57(4):223-224, Apr. 1967.

In 1965 Cherbourg introduced dustless loading. Eleven hundred dustless bins were bought as a start. Cherbourg has decided to abandon curbside collection and have bins brought out from premises and the empty bins returned. Until 1962 disposal was by incineration. Now the incinerator has been demolished and a Gondard pulverizer erected on the site. The town operates a landfill site 7 miles from the collection areas. Unsold pulverized material creates very little nuisance, and rejects are also dumped on the tip.

67-0091

Conrad Engineers. Tenement refuse disposal systems and artificial illumination of communal areas. Los Angeles, Mar. 1967. 26 p. (Distributed by National Technical Information Service, Springfield, Va.,as Publication No. PB 180 879.)

An investigation of two types of refuse disposal systems as they apply to rehabilitated tenement buildings is summarized. The packer-type system in which refuse is compressed is considered superior but may not be economically feasible. The refuse-chute and large cart systems are not as expensive. The feasibility of incineration is also considered in relation to the problems of atmospheric pollution. It is suggested that when tenement building rehabilitation is undertaken on a large scale, it may be a better solution to install in each building a refuse collection system such as chute and packer, or chute and rolling cart, and then provide an incinerator within each square block of buildings. Also included are a bibliography, the Local Laws of the City of New York, excerpts from the Air Pollution Control District of Los Angeles County, Multiple-Chamber Incinerator Design Standards for Los Angeles County, and the proposed Criteria Used for Upgrading Existing Apartment House Incinerators in the City of New York.

67-0092

Conrad Engineers. Tenement refuse disposal systems. In Tenement refuse disposal systems and artificial illumination of communal areas. Los Angeles, Mar. 1967. p.1-16. (Distributed by National Technical Information Service, Springfield, Va., as Publication No. PB 180 879.)

In facing the problem of refuse disposal in rehabilitated tenement buildings, ease and convenience to the tenants are of paramount importance. It is suggested that a refuse chute with doors on each floor be incorporated into every design. With a refuse chute installed, a decision must be made as to how to handle the refuse in the collection area. The packer-type and cart-type systems each have advantages, and both are superior to methods presently in use. The packer-type has proved to be workable in the trial installation, and shows promise of reducing the refuse handling problem to a manageable level. The cost of the machines, purchased on a one-at-a-time basis, makes an installation more expensive than competing systems. This additional investment may be too great for the economics of a rehabilitated tenement building, but the system has so many attractive features that it should not be abandoned. The rolling cart system is less expensive in initial cost and has lower continuing maintenance costs. Sanitation of the carts and their accumulated refuse in the hot, summer months may be a problem. The components of the system are available at competitive prices, and, at least in the City of New York, the municipal collection system is capable of handling it. Initial cost and operating cost comparisons are tabulated.

67-0093

Construction equipment exhibition. Public Cleansing, 57(11):591, Nov. 1967.

Over 200 exhibitors occupied the 40-acre site at Crystal Palace, London, during the Fourth International Construction Equipment Exhibition which opened on Oct. 2. Leading construction equipment manufacturers from Europe, Canada, Japan, the United States, and the U.S.S.R. exhibited 389 separate classifications and demonstrated mechanical diggers, tractors, bulldozers, excavators, and other earth moving machinery. Many of the machines were of new design and in some instances completely revolutionary. Of importance to local authorities were the wide range of earth moving machines, ancillary equipment, attachments, powered and non-powered land tools, compressors, welding equipment, engines, cranes, dumpers, fork lift trucks, etc. Ten technical papers were also presented an various subjects. Of particular interest to cleansing officers were those dealing with organization of a plant depot, changes in shape and structure of the labor force, recruitment and training, computer contribution to productivity, safety and accidents, and building regulations.

67-0094

Contractor-innovator: stationary packer serves camera plant. Refuse Removal Journal, 10(9):24-25, Sept. 1967.

The operation of Henry B. Russell & Sons, Inc., the largest private refuse hauler of about 20 operating in the city of Cambridge, Massachusetts, is described. This firm has developed its own equipment, including a patented container on which the hook and bars are eliminated.

The Russells utilize adaptors to double the capacity of a 2-yd cart, and have also designed special vents for bins to receive dusts. One source of the dust has been the grinding of sunglasses from a Polaroid Corporation plant serviced almost entirely by the container system. The first stationary packer, for use at the Polaroid plant, was installed at the beginning of 1967. It is an SPA with a 4-yd hopper attached to a 40-yd container. Another will be installed at the camera and film building. Collection vehicles used by the Russells are mainly '950' Fords, and the firm maintains its own maintenance garage. Collected wastes are trucked to incinerators operated by the Boston Metropolitan Commission, or to a landfill within 30 miles of the Cambridge city limits. Leonard J. Russell, Treasurer and General Manager of the firm, is running for office on the Cambridge City Council. He is the first man in the wastes management industry in Cambridge to do so.

67-0095

Correa, A. Y. Collection, transportation, and final disposition of garbage. Boletin de la Oficina Sanitaria Panamericana, 63(6):530-535, Dec. 1967.

The problem of garbage collection and disposal of solid wastes in Mexico is briefly outlined. The method of sanitary landfills, ultimately to be used as parking lots and recreation grounds, is cited. Where this technique is used, the surrounding land appreciates in value, water contamination is reduced, and breeding grounds for insects and rodents are eliminated. Publicity and promotional campaigns in Mexican cities are followed up by the establishment of specific programs to improve garbage collection by utilizing mechanical street sweepers and more efficient load-packer vehicles. Between 1967 and 1970, the projected collection and disposal of solid wastes should service 78 localities, encompassing the principal cities. Garbage to be disposed of daily averages 750 g per person. This sanitation program is a manifestation of social justice which is sought by the people. (Text-Spanish)

67-0096

Dealing with domestic refuse. Engineering, 203(5267):499-508, Mar. 31, 1967.

This report surveys the equipment available for collection and disposal of domestic refuse and considers the content of refuse according to its source. Collection is the first point discussed, one or two variants of the dust bin and the Binsac paper sack system being mentioned briefly. Two centralized collection systems are explained in detail, the first based on the chute method and the second on suction. Pictures and descriptions of bulk refuse skips, compression and loading mechanisms, hoisting equipment, and tipping trucks are given. Problems arising in connection with transfer stations and salvaging are described, as well as uses for salvaged materials. Controlled tipping, incineration, pulverization, and composting are compared in terms of pollution, disposal efficiency, handling and cost.

67-0097

Eggen, A., and O. A. Powell. Waste disposal in Connecticut; collection vs. disposal. In Feasibility study of a new solid waste system DUST/TR-6701. Hartford, Conn., University of Hartford, Division of Urban Science and Technology, Nov. 1967. p.9-11.

A questionnaire was mailed to 26 Connecticut towns with populations greater than 25,000 requesting information on their waste disposal practices and costs. The group was chosen to include most of the relatively urban proportion of Connecticut's population. It was concluded from a study of the distribution of population that solid waste systems designed for 50,000 people could easily serve single towns or groups of two or three smaller towns; that units sized for 100,000 could handle cities or several larger suburbs; and units sized for 200 to 300 thousand could serve a single city and part of its suburban cluster. There was a strong tendency for municipalities to handle their solid waste problems themselves, a trend consistent with Connecticut's suspicion of regionalism. Waste collection is mostly by packer body truck. Almost all towns dispose of an unseparated mixture of garbage and rubbish; only 27 percent practice salvage. Solid waste collection and disposal costs are summarized. Operating costs for collection are two or three times disposal costs, but the total costs are much closer. Disposal costs are increasing by less than 5 percent per year. Collection costs are probably increasing mainly due to rising labor costs while disposal costs are increasing because of the necessity of shifting to sanitary landfilling and incineration.

67-0098

80,000 dust-bin loads a day. Institute of Materials Handling Journal, 7(3):80-81, Aug. 1967.

A talk by the general manager of the Birmingham Sálvage Department to members of the Birmingham Section of the Institute of Materials Handling in January 1967 is reported. The refuse collection and disposal system of Birmingham, its personnel, equipment, and operation are described. Comments include the type of dust bins and vehicles used in collection, extraction of ferrous metals by magnets, recovery of semi-precious metals by hand which are sold as salvage, and recovery of woolen garments which can be reprocessed and remade into cloth. With many items, such as paper, the cost of recovery is not justified by the price obtained, and disposal by incineration is used. Recovery from the sale of salvageable items is about £250,000 per year, while the cost of the disposal service to the city is about £2,250,000 per year.

67-0099

Einbrodt, H. J., and H. Reploh. Composition and characteristics of street rubbish of a large industrial city. Staedtehygiene, 18(6):120-125, June 1967.

Thirty-five samples of street rubbish from seven streets of an industrial city of the Ruhr Valley, Germany, were taken and the various grain sizes determined. The spectrum of grain sizes of all samples ranged from 25 microns to 8 mm. Regardless of the neighboring industry, the highest frequency of dust particles lay between 100 and 200 microns and at 500 microns, and an astonishingly similar pattern of grain sizes was found to exist throughout the city. A heat loss analysis showed that street dust is composed of 91.5 percent mineral and 8.5 percent organic substances. Chemical analysis indicated that the particles of size 20 to 25 microns were composed of silicondioxide (38%), or organic substances (18%), and of various other substances such as lead, MgO, potassium oxide, calcium oxide, alumina, and ferric oxide. Among the 100 to 200 micron particles an increase in silicondioxide contents was found which further increased among the 400 to 500 micron class. The low amount of organic and combustible substances indicates that street dust is suited neither for incineration nor for composting. (Text-German)

67-0100

Eppes, M. H., C. R. Richards, and G. E. Nash. Refuse collection and disposal in Caroline County Maryland. College Park, Maryland Technical Advisory Service, University of Maryland, May 1967. 141 p.

A study of refuse collection and disposal in Caroline County, Maryland, does not attempt to provide a detailed plan for solving the problem in the area. A general discussion of the refuse problem as it relates to local government and an outline of the pertinent legal powers delegated by the State of Maryland to counties and municipalities in general and to this County in particular are included. The current situation within the County with respect to refuse collection and disposal is covered, including individual discussion of methods and sites in use at each of the eight incorporated municipalities. A summary of the county-wide problem of illegal dumping of refuse is included as are photographs of the legal sites and various illegal roadside dumping places. Graphs and data indicating population of the area, estimated refuse generation, and maps are included. Discussion of the overall problem includes mention of several alternative or concurrent courses of action which might be used, and advantages and disadvantages of each are analyzed as far as practical. Four appendices: Annotated code of Maryland; Advantages and Disadvantages of Various Refuse Collection Methods; Comparative Cost Computations; and Principles for Sanitary Landfill Operations are included as is a selected bibliography.

67-0101

Erie County Commissioners. Erieland--2000. Environmental health survey report. Erie County, Pa., 1967.

A comprehensive environmental health survey of Erie County, Pennsylvania, is presented. The topics covered are: water, liquid wastes, solid wastes, air pollution, housing, recreation, general health, and planning. The findings of each topic are supported with data and illustrations. A list of recommendations for future action is furnished with each topic. The survey was sponsored by the Public Health Service.

67-0102

Erie County Commissioners. Solid waste. In Erieland--2000. Environmental health survey report. Erie County, Pa., 1967.

A review of solid waste disposal in Erie County reveals that there are problems which need corrective action. The main problems are those concerning inadequate collection of wastes, and an inadequacy in the final disposal of the wastes. The County produces over 500 tons of refuse per day. The smaller, uneconomic and unhealthy disposal sites within the County should be closed and the solid wastes taken to a few, larger, more economic, and properly operated disposal facilities. There are five sanitary landfills, two incinerators, and at least 14 open dumps in Erie County. The County Health Department, through the use of existing laws and regulations, has not been able to control or eliminate these unhealthy dumps. Only 1,500 persons out of the County population of 250,682 are receiving solid waste collection twice per week in the summer. It has been found that little or no provision is currently made for the handling of or disposal of industrial wastes. Junk cars and bulky wastes are a problem in Erie County mainly because of the lack of regulation concerning the handling, storage, processing, and disposal of these wastes. A list of recommendations is furnished.

67-0103

Evans, L. The lifeline of communication; the public relations of public cleansing departments. Presented at Institute of Public Cleansing, 69th Annual Conference, Blackpool, England, June 5-9, 1967. 12 p.

A good public relations program can make the Public Cleansing Department's job easier and more efficient. Public relations methods can insure a better appreciation of the public cleansing service, win public cooperation, inform the public of the many facets of the job of public cleansing, and attract people to careers in public cleansing. A deliberate and planned public relations policy, formulated by a professional public relations officer, is necessary. In decisions affecting the public, information should be widely disseminated before the final decision is taken.

67-0104

Felons used as pickup crews in Chesapeake, Virginia. Refuse Removal Journal, 10(10):30, Oct. 1967.

Chesapeake City, Virginia, recently dismissed 158 public works employees, most of whom were laborers in the sanitation, sewage, maintenance, and traffic engineering departments, for declining to end a walkout. Inmates from the State prison were then recruited to collect the refuse. Members of the labor union warned the residents that prisoners were manning the refuse trucks, but these warnings seemed ineffective, as there was no cooperation from householders in the area.

67-0105

The fight against dirt in Moenchengladbach. Staedtehygiene, 18(12):293-294, Dec. 1967.

During a football game in Moenchengladbach, West Germany, a group of youngsters demonstrated for a cleaner city. This was only part of the city's drive to improve its waste collection system; posters, photographs, and a call to publish essays on this subject in newspapers were used to assure the cooperation of the public. The municipality officially introduced the use of refuse paper bags for waste disposal where existing containers were overloaded, and intends to recommend the use of special paper bags for the disposal of bulky wastes. (Text-German)

67-0106

Finland's refuse handling methods: Computation without organization. Refuse Removal Journal, 10(12):20, 26, Dec. 1967.

Refuse collection and disposal methods in Finland are described. Because Finland is sparcely populated, she has experienced no difficulties in disposing of wastes, either by composting or dumping. Few towns feature a community refuse service, and most communities merely assign and manage enough dumps for the use of residents. Communities with refuse service may use contractors competing with private haulers; this contract service is usually only to haul refuse away from town. Because of wide variations in amounts of refuse hauled, trips are invoiced by computer according to the quantity of waste picked up, rather than by contracts based on the number of customers serviced. Domestic rubbish is traditionally kept in containers within the houseyards, so the trucks must either drive into the yard or the crews must take the containers to the truck and back. Ordinary open trucks have been used up to now to collect refuse, but a system of interchangeable boxes for refuse trucks is becoming popular, with a special exchange-box of steel replacing the old concrete boxes. To get away from the unhygienic open collection trucks, the Finns are using the Norba KB-system, developed with the cooperation of Malmo, Sweden's sanitation service. Special aluminum or fiber glass bins are utilized, with collection by special hand carts for transfer of the rubbish to collection points. Several towns are using, or contemplating using, this Swedish system, and most private contractors use it.

67-0107

Fredericks, T., and C. Sanders. Work methods and standards. In Proceedings; Fifth Annual Seminar and Equipment Show, Governmental Refuse Collection and Disposal Association, San Francisco, Nov. 9-11, 1967. p.42-45.

Proceedings of a two member panel are presented. The first paper discusses work method evaluation studies as carried out by the American Building Maintenance Company. Time standards are established for cleaning buildings by using a breakdown of sq ft area regarding composition of the floor. Work is classified, and each employee is trained in one aspect of cleaning. Use of craft paper bags for waste collection has simplified this operation. The second paper briefly discusses the city operated refuse collection in Covina, California. Seven trucks are used, two men to a truck. Trucks average 350 hauls per day with once a week pick up. Two front loader trucks are used for commercial routes.

67-0108

Galler, W. S. Study and investigation of solid waste disposal, City of Raleigh, North Carolina. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. A-7.

The current method of waste disposal is by sanitary landfill, but current sites will be filled in 3 to 5 years and land values have risen. Therefore future sites will require long distance hauls or high initial costs. A study, begun in January 1967, will evaluate new sites as well as alternative disposal methods. The collection system will also be studied using a simulation model developed at Northwestern University. Cost saving factors will be investigated as well as the feasibility of separate collection of certain wastes. Landfill sites found acceptable from an engineering standpoint will be evaluated using a site selection model. A market analysis will be made to determine whether composting would be economically feasible along with salvage of metallic and glass items.

67-0109

Goldie, J. H. Notes from a new town in the Kingdom of Fife. Public Cleansing, 57(11):614-615, Nov. 1967.

The town of Glenrothes has inaugurated a pilot scheme using 3½-cu-ft paper sacks for refuse collection. Contrary to expectations, demands for extra paper sacks have been low. This may be due to a special waste paper collection which is in operation at this time. Since a new 16-cu-yd screw-compression Norba, built onto a Ford chassis with a 182 in. wheel base, has just recently been put into operation, it is too early to give accurate performance information on the system. In the near future a pulverizing plant will be constructed to cover the disposal of refuse in Kirkcaldy area. The plant, the Dano Egsetor Type III, is initially designed for a population of 40,000, but provision will be made for the installation of a second Egsetor at a later date. The plant will incorporate an overband magnetic separator with tin baler, and provisions are made for waste paper sorting, baling, and storing. A double rotor hammermill will reduce all glass to a powder form. The pulverized material will be dumped on to an area immediately adjoining the plant. The new town is cleansed partly by street orderlies using barrows equipped either with bins or paper sacks, partly by a pedestrian-controlled electric vehicle, and partly by a Bedford Lacre mechanical sweeper. An additional Bedford Lacre suction sweeper fitted with dual controls will be added in October. Although the initial cost of poly-propathene brushes is more than for brass brushes, their life can be as much as 110 sweeping days as against 14 sweeping days for the brass brushes.

67-0110

A good investment. Refuse Removal Journal, 10(9):14, Sept. 1967.

The American Public Works Congress and Equipment Show will be held October 1-5 in Boston. Equipment of all types will be on display, and experts from government and private industry will discuss latest techniques at this second annual meeting of the Institute of Solid Wastes. The APWA Show also encourages cooperation between private contractors and municipal officials.

67-0111

Hamlin, G. H., and N. Hume. Looking into the future in hauling and disposal methods. In Proceedings; Fifth Annual Seminar and Equipment Show, Governmental Refuse Collection and Disposal Association, San Francisco, Nov. 9-11, 1967. p.55-89.

A proposed unit train disposal system for disposing of the San Francisco Bay Area's solid waste in a sanitary landfill in the desert is described in detail. Initial daily collection will average 5,000 tons requiring 70 cars and four 3,000 hp diesels. Round trip from Fremont, California, (starting point for empty covered hopper cars) will take 36 hr. The plan should be administered by a limited powers agency responsible for administration, inspection, billing, and paying the railroad. For the next 25 years an area of 8 sq miles with a fill depth of 15 ft would be required. Cost would be $2.17 per ton over present methods. A report of solid wastes management, primarily domestic, in Germany resulting from a 2-week study tour is also discussed. German domestic refuse is quite similar to American but contains more ash and fewer cans and bottles. Collection is handled by the municipal government and is dustless. German landfills are often built considerably above the surrounding land elevation; daily covering is not typical. Composting plants at Duisburg and Schweinfurt are described. Incineration with steam or electricity production is common in Germany. Electrostatic precipitators produce extremely clean exhaust gas.

67-0112

Hansen, N. B. Disposal needs new methods. Refuse Removal Journal, 10(5):34, 36, 66, May 1967.

All collection and disposal for San Mateo County is handled by private industry. Landfill has been the primary disposal method. Canyon sites are not available. For the tideland sites there is a shortage of cover material in the County. There are no sites available within San Francisco for future disposal. Many of the disposal sites under consideration, which were formerly approved and properly designed into individual community master plans, cannot be developed until the overall San Francisco Bay Conservation and Development Commission (BCDC) master plan is completed in 1969. Communities have risen along the shoreline making disposal site construction on the tidelands unacceptable. Sanitary Fill Company should construct an incinerator on company holdings as a long-term solution. Incineration would raise disposal costs at least three times over present landfill costs. Landfill sites would still be required for non-combustible debris and incinerator residue. Disposal of refuse originating outside San Francisco will continue through landfill with sites located in remote canyons rather than tideland areas. Some areas are sufficiently far from San Francisco to make hauling uneconomical. No incinerator has as yet been approved for construction.

67-0113

Hickman, H. L., and J. C. Kennedy. Studies of characteristics of municipal and residential solid waste. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. F-3.

Studies by the Solid Wastes Program, U.S. Public Health Service, are in progress on the composition of and per capita discharge of residential and municipal solid waste. Tables show composition data from a study of wastes in residential areas of Cincinnati, Ohio, and municipal areas in the Quad-City New Jersey Projects. Initial studies indicated a loading for a medium income residential area in Cincinnati, Ohio, to be 2.6 lb per capita per day. Further studies planned will investigate factors effecting efficiency of collection and variation in wastes from different residential dwelling types.

67-0114

Hirten, J. Disposal of refuse and solid waste materials. In Proceedings; Fifth Annual Seminar and Equipment Show, Governmental Refuse Collection and Disposal Association, San Francisco, Nov. 9-11, 1967. p.49-54.

The San Francisco Planning and Urban Renewal Association has reviewed proposals for disposal of San Francisco's refuse, and an evaluation of these proposals, with their advantages and disadvantages, is presented. The unit train disposal system would haul refuse approximately 350 miles to a sanitary landfill. Costs would be 18 percent above present levels. A steam generating incinerator could burn combustibles and sell the steam to the Pacific Gas and Electric Company. Costs would increase 42 percent and would not solve non-combustible or construction debris disposal. Ocean disposal has been tried unsuccessfully by New York and Oakland but further study of the ocean environment to determine how solid waste might be injected without harmful effects may provide positive results. Composting is not economically feasible in view of competition with fertilizer produced by the petrochemical industry.

67-0115

Hughes, H. Experience with a Seerdrum. Public Cleansing, 57(10):528-529, Oct. 1967.

Three to four men are needed for running the Seerdrum refuse service in Redditch. One is the Seerdrum operator, who services the equipment in the morning, checks the refuse as it is loaded, and moves the tip truck from the reject conveyor to the adjacent tip face. A second man is the loading driver, who operates a wheeled tractor. The third member is the produce and tip control driver, who operates a tracked tractor (Fiat F. L. 6). A fourth man can be used to collect tip tickets from the contractors and to ensure they unload as close as possible to the face of the refuse heap.
Costs are about 18s 5d per ton processed. The minor trouble that has been experienced in operation and it has been confined to the product conveyor. The plant consists of the Seerdrum, a 3,000-gal watertank, the electrical control box, etc. Conveyors discharge from opposite sides of the building in order to separate rejects from products effectively.

67-0116

Institute of Public Cleansing Conference at Blackpool. Surveyor and Municipal Engineer, 129(3914):24;57-58, June 10, 1967.

The Institute of Public Cleansing Conference is reviewed including points from the presidential address, papers, and discussions. The address gave a brief survey of the technical and economic situations which have started the trend toward adoption of more mechanical methods of refuse disposal. Papers were presented on the removal and storage of abandoned vehicles, the costs of different methods of refuse collection, the collection, storage, and equipment weaknesses of refuse collection services operated by small authorities, and the use of pulverization plants to reduce cost and volume problems of refuse disposal. The discussions urged introduction of new schemes for bulky refuse disposal, suggested screening around refuse bins to prevent plastics and paper from blowing out, and recommended new equipment and improved working conditions.

67-0117

Is the cost justified? Public Cleansing, 57(2):100-102, Feb. 1967.

One paper presented to the North East Central meeting by Mr. R. Stenson raised much discussion on various alternative methods of bulk refuse storage and handling. Conclusions were hard to reach; although the tanker collection system reduces the bulk of refuse, it is fairly expensive. More research is to be undertaken. Mr. Walker said that the operation of the Bradford plant resulted in a 70 percent increase in salvage income during 1965-1966, the figure rising from £15,102 to £26,425. Due to the increase in refuse (6% annually), more men, trucks, and dumping areas are needed. They did find, however, that hiring students during holidays was helpful. Leeds changed to 3¼-cu-ft dustbins and also is responsible for removal and disposal of abandoned cans. A fairly extensive system at Meanwood Road operates in a new reception building with a 350-cu-ft hopper and an up-swept plate conveyor.

67-0118
Jerusalem workers in smart uniforms. Refuse Removal Journal, 10(3):34, Mar. 1967.

Mayor Kolleck of Jerusalem asked a tailor to design and cut smart olive green uniforms for his sanitation workers. Morale went up and respect for the workers increased.

67-0119
Jones, Henry & Williams, Engineers. Solid waste study--collection and disposal plan. Toledo, Ohio, Jan. 1967. 103 p.

A study of Kalamazoo County, Michigan, authorized by the Kalamazoo County Road Commission and supported in part by a grant from the Public Health Service, was undertaken to provide a solid waste disposal plan for the area. Conditions existing at the time of the report are cited and alternative methods of collection and disposal are considered. Incineration and sanitary landfill are both feasible methods in the study area but due to the availability of land, sanitary landfill is recommended as more economical. Provisions for handling commercial refuse are given and special problems offered by industrial wastes of a difficult nature are examined. Costs of the recommended operation are listed and specific Michigan acts which could provide authority for the operation are cited. The terms appearing in the report are defined.

67-0120
Kaupert, R. Ninth Conference of the International Association for Public Cleansing, Paris. Staedtehygiene, 18(10):242-245, Oct. 1967.

Between June 26 and June 30, 1967, the 9th Conference of the International Association for Public Cleansing was held in Paris. About 800 delegates from all over the world participated. A survey of the present state of the art in all fields concerning the disposal of waste was given. The introduction of plastic containers as waste containers was recommended; a switchover to waste paper bags was considered too costly. The use of the waste disposer must remain limited because an overburdening of the drainage system is feared. The trend towards larger waste containers was confirmed by the representatives of all countries. To reduce the amount of waste it was suggested that new ways and means of packing shall be found. Only 25 percent of all cities clean the streets daily. The manual sweeping of streets is still the commonest method. Paris has only 14 sweepers while Prague has 48. Paris prefers to wash its streets. In Germany the heating value of the waste does not exceed 1,500 kcal per kg; it is 3,000 kcal per kg in the United States. Only 43 out of 205 incinerator plants utilize the heat in the United States. In conclusion, the composting process is explained briefly. (Text-German)

67-0121
Kennedy, J. C., and H. L. Hickman. Seasonal variation in municipal solid waste output. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. F-4.

The USPHS is undertaking a study for its Solid Wastes Program to determine the cyclic character of residential solid waste loads and factors responsible for such an effect. The weekly loads collected from the residential areas of a given municipality were recorded for a number of years using incinerator or sanitary landfill records. To eliminate non-seasonal varying factors, loads were averaged over 4 weeks. A variation through the year is thus obtained and several years are studied to determine whether this variation repeats in a cyclic fashion. Graphs are presented for all the above and a mean seasonal variational curve for the total years of record is also presented. Factors responsible for the cyclic effects are physiographical and sociological. Curves will differ for each section of the country and the project proposes a computer program to aid in preparing and evaluating data.

67-0122
Kerr, F. H. Two unusual solid waste solutions. American City, 82(4):114-115, Apr. 1967.

Private contractors collect refuse from Sioux City, but they operate city owned packers to assure a reliable and sanitary collection. Commercial material which is more liquid than solid has to be isolated in a separate section of the landfill and stabilized with tree clippings to prevent a 'gooey mess'. Formerly the city's sewage flowed into the river. Packers had to make minor in-plant changes to minimize the blood, grease, and hair escaping to the main sewer. Paunch manure in sanitary landfills made an unworkable mess so it was stabilized with trees, debris, and building materials in a separate landfill. A Cat D7E dozer covers the paunch manure mixture. Two Cat D7's and an International TD18A compact and cover normal refuse. Landfill sites are open to the public for free dumping. The only limitation is that the refuse must originate within the city limits. City Council imposed a $1 per month per residence refuse-collection and disposal fee. Refuse is collected twice weekly. Residents may set up as many containers as necessary, but each must not hold more than 20 gal or weigh more than 75 lb.

67-0123

Kojetinsky, R. INTAPUC--International Association for Public Cleansing. Staedtehygiene, 18(10):225-227, Oct. 1967.

As the waste problem became more intricate due to industrialization, and waste elimination became more mechanized, the need for exchanging experiences became apparent. In 1928 the national associations for waste problems of Great Britain, the Netherlands, and Germany created an international committee for public cleansing. The 1st international conference was held in London in 1931, the 2nd in Frankfurt am Main in 1935, the 3rd in Vienna in 1938, the 4th in Amsterdam in 1947, the 5th in Edinburgh in 1953, the 6th in Frankfurt am Main. The international committee had become the International Association of Public Cleansing (INTAPUC). Mutual exchange of experiences with new methods and information on progress and on new problems was continued at the 7th conference in Goeteborg, Sweden (1961) and at the 8th in Vienna (1964). Besides discussing waste disposal, city cleaning, incineration, composting, etc., the association has published a dictionary of technical terms in German, English, and French. A list of the present member nations and presiding officers is given. (Text-German)

67-0124

Kojima, R. Japanese trail in waste disposal. Refuse Removal Journal, 10(4):6-7, 38, Apr. 1967.

Japan had no waste disposal problem prior to World War II. Wastes were used as fertilizer; and garbage was fed to hogs. Wastepaper, scrap metals, and glass were salvaged and utilized. Wealthier families had yards ample for incineration. Since World War II the concentration of population in cities has led to increases in the volume of wastes. Chemical fertilizer is used; livestock is not raised near cities. It no longer pays to collect wastes for reuse. All cities now have either a Cleanup Division or Cleanup Section in the Sanitation Bureau. Two hundred and seventy million dollars is to be expended from April 1967 to March 1972 to raise solid waste burning capacity to 600,000 tons a day—95 percent of all solid wastes expected to be produced in Japan. Rubbish and garbage together are put in designated containers or vinyl bags for collection twice a week. Collection is without charge or fee but costs from 20 to 30 cents per household per month. Commercial establishments pay fees in proportion to volume produced. Wastes are finally disposed of by incineration or utilization. Procurement of efficient workers is difficult because of poor pay, inadequate welfare, discouraging environment, and little hope for the future.

67-0125

Last word on dustmen. New Scientist, 36(570):331, Nov. 1967.

A humorous account concerning the ever-increasing amounts of refuse, particularly refuse which will neither corrode nor decay, is presented. The important role of the garbagemen in our modern society is outlined. As a solution to the ever-increasing refuse problem, a rocket-propelled, interplanetary dustcart, operated by refuse collectors and designed to deposit our refuse on the moon, is suggested.

67-0126

Law limits Kansas townships, seek more active leadership. Refuse Removal Journal, 10(8):34, Aug. 1967.

Open dump burning and spreading is still used routinely in most Kansas communities. Townships and counties are not authorized to provide sanitary disposal facilities and towns with populations of less than 10,000 cannot provide their own landfill. This situation may change with the State Department of Health asking for State funds to match Federal funds available under the Solid Waste Disposal Act of 1965. Last September the State Department of Health was designated the official State agency to work with the Federal agency, and last spring the Department of Health was one of the sponsors of a one-day symposium on solid wastes. Collection of trash has changed since 1946, when most Kansas communities used hog feeding to dispose of organic wastes. Due to World War II labor shortages, many communities demanded municipal service for waste collection. In 1947, the legislature authorized cities to establish and provide service, but private individuals were still picking up organic material for hog feed. The pattern of collection changed even further when vesicular exanthema broke out among hogs in 1952, leading to a general ban on the feeding of such raw material. Despite increased collection of food refuse by municipalities, the number of contractors in Kansas has increased 300 percent since the war, as commercial and industrial waste has risen proportionately.

67-0127

Licking County Regional Planning Commission. A refuse disposal study for the Licking County Region. Regional Report No. 2. Licking County, Ohio, Mar. 1967. 89 p.

The significant problems of refuse disposal in Licking County, Ohio, concern refuse quantity and quality, collection problems, disposal methods, and legal and financial difficulties. Recommendations for solving these problems include public education, use of proven methods of collection and disposal, and use of existing enabling legislation. A general description of types of refuse and quantities found and refuse collection systems including use of kraft paper bags for storage, and transfer stations are covered. Refuse disposal methods, especially sanitary landfill, incineration, and composting are considered in detail. Recommendations for a solid waste disposal program for Licking County include centralized, organized collection to eliminate the waste of overlapping private scavenger routes and provisions for more efficient and dependable service. Sanitary landfill is the chosen method of final disposal due to the availability of land for such purposes. The geohydrological setting of the County and best probable sites and areas for sites are indicated. Appendices include sanitary regulations of the Licking County Health district, recommendations for sanitary landfill operations by the Ohio Department of Health, and a bibliography.

67-0128

London centre hears of cleansing practices in Peru, Sweden, America, France, Germany, Kuwait, Guernsey, Holland. Public Cleansing, 57(3):142-143, Mar. 1967.

The following report was given by Mr. McCarthy at a meeting of Corporate Members of the London Centre. Referring to his 4 day visit to Lima, Peru, he said that of the 33 districts (one encompassing 537,000 people on 7,000 acres) 800,000 persons had no access to running water and a film showed the unhygienic conditions at one of the large refuse tips. Mr. McCarthy showed films of the Swedish refuse suction system of moving refuse through pipework connecting various blocks of flats. Based on Swedish installation, the cost would be 108 SF per unit flat on an installation of 1,700 flats. Mr. Flintoff reported on an articulated bulk transport vehicle at Toulouse and impressive architectural layouts and an open-circuit television equipped vehicle at Hamburg. At Kuwait, landfills are desert areas and oil is sprayed on the face to set fire to it at the end of each day. Mr. Shults reported on refuse disposal methods to be adopted at Guernsey. On this island of 20 sq mile (50,000 Pop.), dependent on flowers, tomatoes and the tourist industry, 10 Parish Councils are in charge of refuse collection. Mr. Shults offered the suggestion of controlled tipping on a new site and was invited back to supervise the project in the summer.

67-0129

Marchant, A. J. 1984 in 1967. Public Cleansing, 57(4):189-196, Apr. 1967.

A pneumatic system for conveying refuse over varying distances is used in Sweden. A state hospital at Solleftea has three systems: one for removal of dust and floor sweepings, another for conveyance of soiled linen, and a third for removal and conveyance of general refuse. The maximum distance over which refuse is to be drawn is 1 mile. The layout of the pneumatic system is similar to a sewerage pipe system. Incoming refuse is temporarily stored in a steel cylinder refuse silo. Final treatment is on-site incineration. The filtration of dust is a dry process using six filter chambers with airtight access doors. Dust laden air is taken in at the bottom of the chambers through the cotton bags. To clean the filters, the bags are shaken, allowing the dust to fall into the base of the chambers. It can be washed away into the sewerage system.

67-0130
Michaelsen, G. S., and A. F. Iglar. Disposing of disposables. Presented at Annual Meeting, American Hospital Association, Chicago, Aug. 21-24, 1967. 8 p.

The disposal of disposable items is considered and the field of solid wastes and the hospital is surveyed. A study at one 1,100-bed hospital showed that the amount of predominately combustible packing material associated with use of syringes increased from 12 lb per year to 3,000 lb per year. A survey of 12 hospitals showed 127 disposable items used by various nursing services, 29 by dietary services, 24 used in surgical and obstetrical departments, 26 used by hospital laboratories, and 13 used by the housekeeping department. It is estimated that the heating value of hospital solid waste will reach from 2,500 Btu to 14,000 Btu per lb by 1975. Categories of hospital solid waste include garbage, combustible rubbish, non-combustible rubbish, radioactive waste, and biological material. The handling and disposal of solid wastes from the hospital is complicated by the possibility that seemingly innocuous wastes may include harmful components. Puncture wounds can be a serious threat to personnel who handle the solid wastes. Other wastes, characteristic of the hospital, are potentially contaminated and require special collection and disposal procedures. One example is radioactive waste. The waste collection system usually found in a hospital presents hazards. Since wastes are transported throughout the hospital, a possible route for spread of bacterial contamination is created. Disposal of solid waste on-site is commonly by grinding or incineration. Air pollution is frequently noted as a problem from hospital incinerators. It is concluded that there is relatively little known about hospital solid waste.

67-0131
Music leads trash collectors. Refuse Removal Journal, 10(8):32, Aug. 1967.

Problems of trash collection in Mexico City, Paris, West Berlin, London, and Tokyo are described. Mexico City is running out of landfill space in the dry lake bed used for this purpose. The trash dumped there is scavenged by 15,000 rag pickers who often prefer to live atop the trash heaps. Thus Mexico City employs more people in its sanitation work than any other city. Paris has the greatest density of refuse, almost 3 tons per km. Collection is done in the mornings, from rubber refuse cans called 'Poubelles', but the main problem is traffic density, which slows down the trucks on their rounds. Berlin is running short of space, and in order to stay within the bounds of the surrounded city, West Berliners have decided on construction of incinerators. The first of two such incinerators will begin operation this month. Londoners are among Europe's biggest individual waste producers: 2 lb per person per day. The Deephams Incinerator, to be built by 1970, will hopefully dispose of 700 truckloads a day and produce 27,000-40,000 kw of electricity. In Tokyo, refuse has been dumped into the bay for years, but there is an official move to end dumping in favor of the use of 12 new burning sites. Public reaction to burning is similar to that of most Americans.

67-0132
Myrick, H. N., Seminar Director. Proceedings; Solid Waste in Urban Environments; a Community Action Seminar, Houston, Mar. 9, 1967. University of Houston. 61 p.

The meeting was sponsored by the University of Houston Coordinating Board, Texas College and University System in cooperation with the Texas Air and Water Resources Foundation; the Houston Chamber of Commerce; and the Texas State Department of Health. The papers delivered covered the following topics: solid waste problems in Texas; a basic data system for solid waste; reclamation of solid wastes; refuse collection; and solid waste disposal through composting, incineration, and sanitary landfilling. A list of participants and their addresses is appended.

67-0133
National shows boost industry image. Refuse Removal Journal, 10(7):12, July 1967.

The successful National Refuse Equipment Show and Congress, held in June 1967, demonstrated the strong bonds among the nation's private contractors and emphasized the need for creating a lasting and fruitful relationship with the Office of Solid Wastes and the municipal governments. Lines of communication and their use were stressed by many speakers. Conventions planned for the future are the American Public Works Congress and Equipment Show in Boston in October, and the National Refuse Equipment Show in Chicago in 1968.

67-0134
Neat little bales of garbage. American City, 82(9):32, Sept. 1967.

A Japanese firm renowned for its 'Car Barbecue Plant', which compresses old autos into small packages of high-quality scrap, now has a similar plant to apply the same technique to refuse. This material leaves the assembly line in neat little bales, completely wrapped in wire-mesh vinyl film to eliminate odors, and compressed to about 75 lb per cu ft so the bales will sink, even in sea water. These bales can also be stacked and covered to fill low land, but decomposition will be slow because of the air-tight containers. Refuse-collection vehicles dump their loads into a ground-level hopper. The hopper then tilts, depositing the load on a partly enclosed platform. A sliding cylinder pushes it into a hollow rectangular enclosure and a hydraulic cylinder compresses it. Wrapping with the vinyl film is also automatic, and the Tezuka Garbage Process Plant delivers the compressed bales into the final chute. These baling plants are available in five sizes from 50 tons to 500 tons daily capacity (enough to serve cities of from 20,000 to 200,000 people at current disposal rates). Prices vary from $416,700 to $1,388,9000, F.O.B. Japan. Power requirements are relatively high, from 1,000 to 4,000 hp. They are made by Tezuka Kosan Co., Ltd., of Toyko.

67-0135
Non-removal of waste threatens health in Saigon. Public Cleansing, 57(3):125, Mar. 1967.

One of the side effects of the war in Viet Nam is the appalling state of sanitation in Saigon. Due to the thousands of refugees that pour into the capital, the local forces cannot cope with an ever increasing volume of refuse. Since refuse collection and disposal are carried out sporadically and schedules are not maintained, refuse may lie in the open for weeks. The 'Refuse Removal Journal' suggested that perhaps the Saigon government should call on United States contractors to do the job.

67-0136
Not only the tulip fields. Public Cleansing, 57(11):566-568, Nov. 1967.

A review of the Annual Conference of the Nederlandse Vereiniging van Reinigings-directeuren is presented. Exhibits included a large number and variety of refuse containers. It is suggested that some measure of standardization of containers will be necessary to avoid problems in the future. Strong interest was shown in plastic sacks for refuse collection. The main difficulty in introducing the sack system is that the cost of sacks, if supplied free for twice weekly collection would make the system too expensive. Many tricycles, some motorized, designed and equipped for street cleaning work, were on exhibition. Papers were presented on a tour of England, France, Germany, and Holland to study refuse tipping and on impressions of cleansing practice in Germany, England and the United States. With growth in volume of refuse, incinerator construction is likely to increase. Amsterdam has started construction of a 1,900 ton per day power generating plant, using Martin grates, which will be fed mainly by barge.

67-0137
Ogden, M. Trash disposal problems grow with the population. Diesel and Gas Turbine Progress, 33(11):30-31, Nov. 1967.

Two kinds of trash disposal problems were discussed. First, disposal problems in an area where rubbish production is at its maximum (i.e., the Las Vegas 'strip') were considered. The Silver State Disposal Company, which is responsible for garbage and trash collection in Las Vegas, utilizes its equipment more extensively than is customary in the industry with two shifts of drivers 6 days a week. The company typifies a trend in switching to diesel power with the operation of 16 Cummins C-180 engines in new White model 1564D cab-over-engine trucks. The advantages of these trucks include increased trash capacity, more economical idling, elimination of irritating and time-consuming engine trouble and longer periods between overhauls. The second type of disposal problem involves the destruction of documents containing confidential information. Such material cannot be satisfactorily burned because of its bulk and its composition, which is frequently fire-resistant, and pulpification has proved to be expensive. At Fleet Disposal, Inc. in Los Angeles, James O'Connor designed and built a 'document disintegrator', a hammermill assembly which reduces to hand size everything that is dropped into its hopper. The secondary mill masticates the large chunks until the end product is fluffy. It is then hauled to a landfill dump in a standard rubbish vehicle. The disintegrator can pulverize unsorted materials at the rate of 4,000 lb per hr, whereas the largest incinerators burn about 1,000 lb per hr and pulping machines reduce sorted material at a rate of about 1,700 lb per hr.

67-0138

On with the show at Blackpool. Public Cleansing, 57(9):497-503, Sept. 1967.

The exhibits at the Blackpool Show are described. Refuse collection, street cleaning, snow emergency, and ancillary equipment were represented. Exhibitors included: Dennis Bros., Glover Webb & Liversidge, Arenco-Alite, S & D, Ford, Vauxhall, Perkins, C. A. F., Simon Compactors, Eagle, Atkinsons, Wm. Bunce, Pye Telecommunications, Southalls, Sharna Ware, Butterfields, Reed Medway, Archers, Industrial Brushes, and Dowson & Mason. A brief account is presented highlighting the equipment shown by each exhibitor—from trucks, compactors and cranes, to brushes, paper sacks, and small tools.

67-0139

Paris company is world's largest private contractor. Refuse Removal Journal, 10(9):50-51, 54, 74, Sept. 1967.

The French company, Sita (Societe Industrielle de Transports Automobiles), the world's largest private refuse removal operation, has been servicing Paris since 1919. It handles about 65 percent of the total domestic haulage in Paris, amounting to 980,000 tons, and has branches in other localities, mostly in the Parisian suburbs. An affiliate serves Abidjan, the capital of the Ivory Coast. Commercial refuse in Paris is collected by a number of smaller contractors but Sita has only a small part of this business. Operating with 485 vehicles in Paris and 190 in the suburbs, the company collects refuse daily, and starts early in the morning. Vehicles, most with a 20-yd capacity, are built according to designs by Sita's own engineers and are operated by a driver and three pick-up men. In Abidjan, both domestic and commercial wastes are handled, and part is composted using the Humuci method. The company has encountered difficulties in marketing the compost, despite its high quality, and sometimes gives it away. Paris also has the largest plant for the incineration of solid wastes. Located in Issy-les-Molineaux, this plant can process about 57 tons an hour; its nominal capacity is 400,000 tons. This plant is deemed so successful it is being used as a prototype for other incinerators, including one being built at Ivry which is scheduled for completion by 1969. All these plants are or will be operated by TIRU, a branch of the French national electric company. Steam for winter heating and electricity are produced by burning the refuse. The Martin inclined-stoker-type furnace used is described.

67-0140

Perry, G. F. H. Bigger Wolverhampton presents big task for cleansing department. Public Cleansing, 57(4):201-204, Apr. 1967.

Refuse in the County Borough of Wolverhampton is collected using a fleet of trucks. The incinerators receive refuse from chutes and burn it. They are fitted with gas-fired after burners and consume any smoke that may arise from the primary combustion to comply with clean air regulations. An area has been supplied with paper sacks instead of dustbins for the storage of refuse at domestic properties. Refuse is disposed of at one of five tips or an incinerator. The increased use of packaging and the extension of smoke control areas, with its reduction in the use of solid fuels for heating, is giving rise to refuse of greater bulk than before; the percentage of cinder and ash is much less and the proportion of paper and plastic is much higher. Waste paper is collected separately; 160 tons per month are sent out for pulping and subsequent reuse; 80 vehicles are used for transport. The department is controlled by the Public Works.

67-0141

Pioneering company began in 1856. Refuse Removal Journal, 10(9):12, 13, 82, Sept. 1967.

Dooley Bros., one of the largest haulers in the Boston area obtained its first refuse collection contract with the City of Boston in the late 1930's. The company now also holds a 5-year contract with the city of Somerville to remove the residues of its incinerator and other wastes. It is also engaged in other municipalities' household collections. Among its major commercial accounts are Boston University, Massachusetts Bay Transportation Authority, the footwear branch of B. F. Goodrich Co. and two hospitals, the Boston State and Beth Israel. In the two hospitals stationary packers are employed. Even though their installation involved a comparatively high initial investment, they are now reducing pickup costs for the institutions by 25 to 30 percent. To handle the collection and removal of wastes in the amount produced at the present time, Dooley Bros. started with Dempster Dumpmaster units and front-end type containers. Then it acquired Leach rear-end loaders. It is now a distributor, through its equipment company, of Hercules Galion E-Z Pack products. The number and capacity of incinerators presently operating in the Boston area is clearly insufficient. The major landfill site can continue to serve for a year or two at the most. Additional sites are not available in the Greater Boston area. Some refuse is burned at sea, but this method of disposal cannot be undertaken in rough seas or fog. A metropolitan commission is now charged with looking into the future and proposing solutions to the disposal problem, which is considerable.

67-0142

Proceedings; Fifth Annual Seminar and Equipment Show, Governmental Refuse Collection and Disposal Association, San Francisco, Nov. 9-11, 1967. 135 p.

Proceedings of the seminar, sponsored by the Governmental Refuse Collection and Disposal Association are presented. The program included talks on: public health aspects of refuse collection, safety practice in refuse collection, work methods and standards, collective bargaining for municipalities, proposed solid waste disposal methods for San Francisco, proposed unit train-landfill disposal method for San Francisco, disposal methods in Germany, street cleaning practices, and disposal problems in San Francisco. Appendices include names and addresses of attendees, exhibitors and members of the association, and the constitution and by-laws of the association.

67-0143

Proceedings; INTAPUC Ninth International Conference, Paris, June 26-30, 1967. International Association of Public Cleansing. 277 p.

Topics covered in the papers are an international survey on storage and collection of house refuse, treatment of municipal refuse for use in agriculture, sale of municipal refuse compost in the Netherlands, incineration of municipal wastes without heat utilization, refuse incineration with heat recovery, and an international survey on street cleaning and snow clearing.

67-0144

Proceedings; Second Annual Meeting, Institute for Solid Wastes, Boston, Oct. 3-5, 1967. Chicago, American Public Works Association. 67 p.

The technical papers presented at the meeting covered such topics as: information systems for management of sanitation departments, regional solid waste disposal systems, equipment for refuse collection, and heat recovery in waste incineration. Also included are: The Report to the Membership, a list of all Committees and their Members, a report on the Ninth Congress of the International Public

Cleansing Association held in Paris, France in June of 1967, the By-Laws of the Institute for Solid Wastes, and the APWA Institute for Solid Wastes membership lists.

67-0145

Putting technology to work on waste. Public Cleansing, 57(3):145-160, Mar. 1967.

The collection and disposal of refuse is conducted through a 'dirt-under-the-rug' approach and practices need to be renovated. Investigation and demonstrations of technical feasibility have been conducted for incineration, composting, landfilling, grinding organic wastes, and salvage and reclamation, but little research has been directed to the reduction in volume of refuse. Serious concern arising from air, water, and land pollution due to solid wastes has resulted in investigations and systems analyses. The different groups which offer proposals for solving the solid waste disposal problems were examined in order to find solutions: solid waste health departments, sanitary engineering firms and solid waste disposal process, and equipment or systems entrepreneurs. The following problems were examined in order to find solutions: solid waste production and initial handling; collection systems; transportation; and disposal systems. The disposal systems were further broken down into 'disposal without material or energy recovery' as: open dump, sanitary landfill, central incineration, and on-site incineration; and 'disposal with material or energy reclamation' as: grinding garbage to the sewers, feeding wastes to swine, and fertilizer production. Lack of awareness and inadequate technology coupled with market, politics, and existing institutions are major obstacles to the solution of refuse problems. The following are some of the recommendations made: support the Solid Waste Disposal Act; conduct comprehensive studies and investigations; and alert decision-making public administrators to the refuse problems.

67-0146

Refuse industry in bay city. Refuse Removal Journal, 10(5):28, 30, 32, 67, May 1967.

Most of San Francisco's refuse has been collected by contractors. There are four methods: Household and commercial refuse deposited in metal containers with organic and inorganic mixed; discarded food from large restaurants collected by hog raisers; street refuse collected by the Street Cleaning Bureau; and waste paper collected by waste paper companies. An incinerator, erected in 1896, could handle 300 tons. Since the refuse amounted to 500 tons per day, much unburned matter was left among the ashes to be hauled to San Mateo County and deposited on low swampy areas. A new incinerator constructed in 1910 did not operate. Sanitary Reduction Works found that operating the old incinerator was a loss. Because of many scavengers collecting in the same areas, a law was passed in 1919 to schedule rates and consolidate collectors into a single company. The incinerator polluted the area. The plant was honeycombed with rats. In 1926, The City Garbage Removal Company initiated an ordinance permitting anyone to collect garbage. Chaos again prevailed. In 1935, the Board of Supervisors gave Sanitary Fill Co. permission to establish a landfill with a maximum charge of $1.00 per ton to collectors.

67-0147

Sanitation industry yearbook is published. Refuse Removal Journal, 10(9):36, Sept. 1967.

The Sanitation Industry Yearbook, now available in its fifth (1968) edition, is an equipment handbook, operating guide, encyclopedia, and trend analysis, all in 104 pages. A valuable desk reference for solid waste managers, it also is a barometer for the industry. Major categories in the equipment section include sanitation equipment, landfill equipment, packers, balers, incinerators, plastic barrels, sweepers, snow equipment, and paper sack systems. In the text section, the Yearbook continues to present practical articles for operation of a private refuse collection company or a municipal department. The editors also look seriously at composting developments, noting that no conclusive market research study has been published.

67-0148

Sanitation navy. Refuse Removal Journal, 10(6):6-7, 39, June 1967.

New York City has four tugboats and forty barges which go from nine marine transfer stations to a 3,000-acre

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67-0148

Sanitation navy. Refuse Removal Journal, 10(6):6-7, 39, June 1967.

New York City has four tugboats and forty barges which go from nine marine transfer stations to a 3,000-acre landfill at Fresh Kills on Staten Island. Hopper capacity of the barges is 2,015 cu yd. Mixed refuse pours into the marine transfer stations at a rate of 7,200 tons a day. Tugs are switched about by the sanitation department which uses its own radio frequency. Scheduling is determined by the tides. If a fire occurs on a barge, fireboats are sent out. Two floating dock diggers (large cranes with 10-cu-yd buckets) can unload a barge in 2 hr and 45 minutes. Marine transfer disposal costs $3.10 per ton as against $1.23 per ton for landfill and $5.41 per ton incineration.

67-0149

Scottish centre discuss trade waste and public relations. Public Cleansing, 57(1):21-26, Jan. 1967.

Problems of refuse collection were discussed at the autumn meeting of the Scottish centre. The Glasgow corporation has no legal responsibility to deal with collection, removal, and disposal of trade refuse. Mr. Bathgate suggested that an assessment of the amount of material to be uplifted from the traders be made and that a charge be imposed after taking into consideration the contribution made to the rates. An allowance of 20 percent of the output or one bin per day is made with respect to the domestic part of the refuse. An allowance of 35 percent is made to restaurants and 50 percent to hotels. There is no charge for hospitals and charitable institutions. Tipping and disposal facilities should be made available where industrialists and traders remove their own wastes. No charge is to be made for removal of trade refuse within limits of normal collection. Tipping facilities in Aberdeen are available at a charge of 6s per load no matter what weight. Waste which could not be tipped safely—tires, sawdust, etc.—is refused.

67-0150

Shults, F. Refuse disposal—the Guernsey problem. Public Cleansing, 57(5):249-252, May 1967.

Guernsey, with an area of 24 sq miles and 45,000 population, is economically dependent on tourists and the production and exportation of flowers and tomatoes. Refuse collection begins at 5:00 am and finishes at noon so that the labour force can carry on with their second jobs. The most commonly used vehicle is the side-loader. Collection standards are below average and are hampered by Guernsey's form of government. At St. Sampson, an average pit, tipping is in a haphazard manner. The refuse layer depth is about 15 ft, extends the entire 80 ft of the quarry, and has little more than a thin skin of primary seal. Recommendations by the Board of Administration improved the appearance, compaction, and control of the tip. The next problem was Dyson's Quarry, about 2½ acres in extent, waterfilled and about 100 ft deep. Due to illegal tipping since before World War II, the depth registered only 66 ft in the center, decreasing rapidly toward the bank. The quarry was drained and dried. The Parish Council ruled that it was to be used for controlled tipping unless it created a nuisance.

67-0151

69th Institute of Public Cleansing Exhibition. Surveyor and Municipal Engineer, 129(3913):34-36, June 3, 1967.

Vehicles displayed in the Institute of Public Cleansing exhibition are described in some detail. Pictures of many of the machines are included, and the manufacturers of all are given. The exhibition contained gritters, sweepers, loading equipment, power cranes, tipping trailers, tractors and others.

67-0152

Spencer, F. J. New concepts in solid wastes collection in Urbania. In Proceedings; Solid Waste in Urban Environments; a Community Action Seminar, Houston, Mar. 9, 1967. University of Houston. p.48-51.

The problem of solid waste is fundamentally a materials-handling problem. It is complicated by the attendant factors of health hazards and political vulnerability in urban environments. Central to the handling of all wastes is the consideration of where the optimum point of eventual disposal lies. In the situation where garbage disposers in domestic kitchens are used in connection with an aged sewage handling facility, there is a problem of incompatibility of systems. A central incineration unit might serve a spread-out community with varying population density and varying economic activities. Systems analysis of household collection systems had indicated the advantage of paper-sack collection systems. Collection of non-residential waste involves the interposition of a size-reduction step, preferably at or near the source of generation, to facilitate achievement of suitable high bulk densities. Devices such as shredders, compactors, and other comminuting units deserve serious consideration as interfaces between generation and collection of such refuse. Preparative conversion is necessary before efficient collection of industrial wastes can be applied. Scrap automobile yards use crushers and multiple compactors. Spent acid recovery systems usually recover a portion of the total fresh acid, the rest representing a mounting disposal problem. By-product hydrochloric acid has been found to be an efficient disposal agent for metallic and other inorganic wastes. The redesigning of all packages and consumable products with a view towards their disposability is a necessity. One last concept is the future use of ultra-high-energy sources for refuse disposal.

67-0153

Spilhaus, A. Waste management and control. Scientist and Citizen, 9(11-12):219-223, Nov.-Dec. 1967.

It takes less energy to collect and control wastes at the source. Since no-return bottles and cans decompose slowly, perhaps a Federal law could prohibit or tax their usage. A mass collection system and disassembly plant for reusing automobiles is suggested. A mountain made of junked automobiles can be used for skiing now, and mined later when our high grade iron ore supply is depleted. Prevention of smog and pollution (air, water, land, noise, and smell) could eliminate the need for zoning and long-distance transportation because citizens would no longer mind living near industry. Since new technologies for transportation cannot be tried in older cities because they must be physically compatible with waste systems, it is advised to build an experimental city with experimental facilities. One should experiment with waste heat sewers and utilization of waste heat for power production in modern incinerators. Buildings in the experimental city should be built so that they can be disassembled like an erector set in case there are mistakes.

67-0154

Stranger on the shore. Public Cleansing, 57(11):603, Nov. 1967.

The removal of dumped cars from beaches, river estuaries, and canals has until recently been an unsolved problem, because the soft ground prevailing in these places prevents ordinary wheeled or tracked tractors from operating successfully. Recently an amphibious vehicle, the Rolba Musk-Duck rubber tracked tractor with bulldozer blade, was adopted in Northern Ireland for this kind of operation. The wreck was attached to the winch of the Musk-Duck, towed out of the water to a firm site from which it could be collected by ordinary transport.

67-0155

Tatarian, S. M. Annual banquet address. In Proceedings; Fifth Annual Seminar and Equipment Show, Governmental Refuse Collection and Disposal Association, San Francisco, Nov. 9-11, 1967. p.95-105.

Disposal problems in San Francisco are discussed. Street cleaning is done under city management; household and commercial refuse, if collected and disposed of by two licensed companies, is regulated to some extent by the city. History of the landfill operation at Brisbane, which is the present disposal site for San Francisco, is presented. This site will only be operable for another 5 years, mainly because of objections from the city of Brisbane. Alternate methods are outlined. Desert landfill is a good possibility but incineration seems most feasible despite some difficulties. A proposal being considered and endorsed by the Chamber of Commerce would produce steam in the incinerator process and sell it to the Pacific Gas and Electric Co.

67-0156

Tokyo. Public Cleansing, 57(2):65-67, Feb. 1967.

The Public Cleansing Law (1954) centralizes Tokyo's cleansing service. Tokyo's metropolitan area includes 23 wards, suburbs, and islands, with a population of 10,920,577. Their Bureau of Public Cleansing consists of three Divisions which are subdivided into 18 sections with 37 branch offices. The Bureau also includes 9,588 employees, 1,347 vehicles, 161 vessels for refuse, 187 for night soil disposal and 16 for sweeping. Their budget totals 21,694,205,000 yen. The 16 mechanical sweepers collect 80 tons of refuse daily. Fifty-one workmen on 16 vessels collect 48 tons of refuse from 33 rivers daily. Night soil is collected from cesspools by suction tanker vehicles and dumped into the sea. Most other refuse is also transported by barge. The largest reclamation area is at Tokyo Bay and the largest landfill site at Yumenoshima is nearly used up. Most disposal is free but a charge of 18 yen per 10 kg is imposed for refuse over 10 kg per day or over 200 kg at one time. Refuse was removed from 'gomi' boxes, but now each householder must provide a portable receptable with lid for collection. A total of 9,000 tons is removed daily. The Bureau also collects carcasses, inspects septic tanks, and provides for laborers to cope with the increase in refuse during spring cleaning.

67-0157

VKW system for Middleton. Public Cleansing, 57(1):17, Jan. 1967.

The plant can handle 60 tons of refuse per 8 hr day. When arriving at the Depot, a vehicle will enter one of six tipping bags and then tip into a reception pit of 750 cu yd capacity. Dust extraction is provided. The extracted dust-laden air is fed as primary air to the furnace. The refuse will be fed from the pit to the incinerator charging hopper by a crane. A feeder at the bottom of the hopper discharges refuse into the furnace. Grits and clinker from the incinerator are conveyed to a clinker storage hopper. The clinker passes beneath a magnetic separator and ferrous metals are passed to a baler. Gases are discharged from a chimney.

67-0158

Waste collection and disposal in Kenosha. Public Works, 98(9):68, 70, Sept. 1967.

The Waste Division of the Department of Public Works in Kenosha, Wisconsin, is described. The Division has 60 employees making approximately 40,000 collections a week. Three men are assigned to the operation of the incinerator, one is assigned to landfill maintenance, one is a janitor, and 55 are assigned to collection. The Waste Division fleet consists of 29 16-yd packers for collections; two 8-yd dump trucks for removal of ashes from the incinerator, and a heavy duty tractor for leveling and covering at the landfill site. Supervision transportation consists of two pick-up trucks and a car, all equipped with two-way radio. The Waste Division operates the incinerator for burning of combustibles and a landfill site for the disposal of non-combustibles. During 1966, the amount of combustibles collected and disposed of amounted to 12,698 tons at a cost of $23.96 per ton. A total of 15,703 tons of non-combustible material was collected and disposed of at a cost of $12.29 per ton. At times, many of the trash trucks were also used for garbage collection in emergencies, inclement weather, and holiday weeks. During periods of heavy snow, seven of the Division's diesel trucks were also used for snow plowing, in cooperation with the Street Division.

67-0159

Whitworth, B. Refuse disposal - an analysis of alternatives. Public Cleansing, 57(6):321-335, June 1967.

The Local Government Operational Research Unit has examined long-term disposal and collection service for the City of Coventry. Coventry (pop. 300,000) disposes of 100,000 tons of refuse per year with costs of 70s per ton collected and 7s per ton for disposal. The two tips now being used will be filled within 5 years. The proposed future sites are 8 miles outside of Coventry and will require the construction of transport plants. Capital costs of construction are £200,000. These plants would also pulverize or burn the refuse and though more costly, would save on bulk-haulage and tipping costs. The aim of the study was to clarify the costs and other advantages and disadvantages of several alternatives. Graphs are presented which show estimated costs of collection, plants, bulk-haulage and tip operations, and also the net income from salvage and from disposal of trade refuse.

67-0160

Wilson, H. T. Collective bargaining for municipalities. In Proceedings; Fifth Annual Seminar and Equipment Show, Governmental Refuse Collection and Disposal Association, San Francisco, Nov. 9-11, 1967. p.46-48.

Public employees feel they need a union to protect their rights and insure bargaining power. The Civil Service Board does not really represent employees. If complaints are taken to the Board, the decisions of the Board are usually management oriented. California associations are basically insurance-supported associations, and management oriented.

67-0161

World survey finds less organic matter. Refuse Removal Journal, 10(9):26, Sept. 1967.

A summary of refuse composition is presented for 15 countries, listing the percentages of ash, paper, organic matter, metals, glass, and miscellaneous trash. In America, paper and plastic wastes are increasing while food wastes are decreasing—both factors resulting from increased packaging and consumption of frozen foods. Similar trends are evident in Canada, the United Kingdom, and Sweden. Generally, the more electricity, gas, and oil a country uses for heating, the less its ash refuse content. Emphasis on consumer packaging results in increased paper and plastic refuse. France, Spain, Switzerland, the Netherlands, Norway, and Finland report lower ash refuse content and a resultant higher proportion of paper. Refuse totals are increasing in Rotterdam, Israel, and Czechoslovakia, with Poland expecting an increase.

COLLECTION AND TRANSPORTATION OF REFUSE

67-0162

Affluence plus paper equals mountains of debris. Refuse Removal Journal, 10(10):18, 20, Oct. 1967.

Affluence, and the fact that Sweden is Europe's largest consumer of paper, combine to cause a high refuse yield. The average Swede generates about 8.8 lb of refuse a week. Since Swedish refuse is bulky, compaction vehicles are employed. The vehicle receptacles hold from 10.9 to 16.4 cu yd. About 50 percent of the towns use the dustless or closed loading method. To facilitate the transfer of refuse from the house to the collection vehicle, a method using mechanical suction has been used experimentally. Automatically operated valves, located at the bottom of refuse chutes, let air and refuse into a steel tube under vacuum, and the inrushing air carries the refuse to a receiving hopper. Different containers for storing the trash before collection are described, the most successful being plastic treated sacks. Since Sweden does not use home incinerators, devices for automatically changing the receptacles under the chutes and units for compressing the refuse are being installed in large apartment projects. An incentive pay system for garbage collectors has been used successfully and has resulted in a considerable reduction in both men and equipment. Collection charges and refuse collection administration are also discussed.

67-0163

Arrests and bulk depots help to keep city clean. American City, 82(9):32, Sept. 1967.

New York City's Department of Sanitation arrested 48 truckers in the first 7 weeks of a program designed to crack down on illegal dumpers. Those arrested face court action and can receive fines up to $500 for dumping on city streets and vacant lots. In another move to help keep vacant lots clean, the department opened 19 junk depots in the five boroughs to receive old furniture, appliances, and similar bulky objects. Householders may drop off bulky junk at the depots anytime between 8 am and 8 pm on any day of the week including holidays. This does not include garbage, which is collected on a regular schedule, or commercial waste, which is collected by private cartmen. In the first 2 weeks of the 'haul-it-yourself' program more than 1,000 tons of junk had been brought to the depots, and by the end of the second week it was being brought in at the rate of 50 truck-loads per day. Those not wishing to avail themselves of the program may still utilize the department's regular bulk-collection service. This requires the householder to call the local borough office of the Sanitation Department and make a mutually convenient date for a special free pickup.

67-0164

Attebery, J. E. We're switching to diesel-driven refuse trucks. American City, 82(8):79-80, Aug. 1967.

Phoenix, Arizona, is switching to diesel driven refuse trucks, because they last longer, cost substantially less to operate and with proper care do not produce smoke. Cost comparisons for 20-yd and 24-yd compactors and 12-yd dump trucks show that the gasoline-powered units cost respectively 40 percent, 80 percent, and 40 percent more to operate. In addition, diesel engines are expected to last 5 years as compared to 2 years for gasoline engines. Reduced engine breakdown has also been experienced with diesel engines. To prevent excess smoking the fuel flow is carefully adjusted and checked often on diesel engines. Further, it has been found that the use of automatic transmissions reduces truck maintenance considerably.

67-0165

Band members lend a hand in New York City's schedule. Refuse Removal Journal, 10(12):14, Dec. 1967.

The 10,000-man New York City Sanitation Department is said to be short some 600 men. Furthermore, the city administration, the City Council, and others are debating the city's ability to afford the Sanitation Department's band. Earlier this year the mayor tried to eliminate the band by trimming its expenses from the budget, but the City Council overruled him. The band has played, until recently, at city functions since 1912. Its members performed for seven months of the year and spent part of the winter sweeping the streets. Now its members are loading refuse. The Sanitation Commissioner has promised to reinstate the band after personnel problems are solved.

67-0166

Battle tactics for clean fuel. Refuse Removal Journal, 10(7):41, July 1967.

Refuse haulers and landfill operators must constantly contend with dirt. Clean fuel and clean air are the prime requirements for maintaining motor equipment at peak performance and extending its life. Dirty fuel will clog filters and stop the flow of fuels. Keeping air-borne dust from vital engine parts is also important. An air pre-cleaner is often used, as well as an air cleaner, to prevent leaves or other flying particles from being drawn into the air cleaner.

67-0167

Benjafield, F. E. Mobile conveyor for industrial refuse. Public Cleansing, 57(11):584-585, Nov. 1967.

The bulk of the refuse of an industrial township, outside Pretoria, consists mainly of broken crockery, broken concrete, rubber, plastic, metal, glass, etc., of all shapes and sizes, and in addition, slurry and plaster-of-paris in semi-liquid form. To overcome the tedious hand loading of this refuse a new scheme was developed, which comprised the use of a troughed belt conveyor similar to those used for stacking bags of grain, or raising clay from pits, etc. The machine was designed and was constructed in such a way that it can be lowered and towed behind the refuse vehicle. It was recently put into operation and apart from a few teething troubles, which were soon rectified, the machine has been found to function very satisfactorily. The specifications and cost of the unit are briefly outlined.

67-0168

British set specs for chute hopper. Refuse Removal Journal, 10(10):16, Oct. 1967.

The British Standards Institution has issued revised specifications for refuse chute hoppers. They include detailed requirements for the fittings, normally installed on a landing or in a corridor, and provisions for the use of certain materials in the manufacture of hoppers, such as cast aluminum. The standard does not restrict the design of hoppers to any particular pattern, but gives certain features which are considered essential for their satisfactory functioning; e.g. to prevent blockage of the chute the hopper opening should be of smaller size in relation to the diameter of the chute. Copies of the specifications, document BS 1703: Part 1, may be obtained from the U.S.A. Institute of Standards, or the British Standards Institution (101-113 Pentonville Road, London, N.1.).

67-0169
A British Shark. Public Cleansing, 57(11):592-593, Nov. 1967.

The German-designed 'Shark', which permanently reduces refuse volume by the combined effects of the crushing and breaking action of the rotating ribs in the loading hopper, the continuous tumbling of the refuse in the drum during collection, and the progressive crushing effect of the spiral plates in the drum, is now available on a British chassis. An example of this unit consists of a 'Shark' body mounted on a Seddon 14 ton chassis with seven-seat crew cab and powered by the well-proven Perkins 6.354 diesel engine with a full torque pto. Drum capacities vary, according to the type of chassis, from approximately 5 cu yd to 25 cu yd with an average compression ratio of 3 to 1. Uncompressed loads of up to 75 cu yd of refuse can therefore be obtained. Another modification is the addition of a lip to the loading hopper of the Shark refuse collector, which raises the loading height to a more convenient level and increases hopper capacity. The complete unit incorporates several important safety features; it has been demonstrated that maintenance costs are very low.

67-0170
Browne, H. H. Report of the working party on refuse collection: legal and administrative aspects. Public Cleansing, 57(8):405-416, Aug. 1967.

The report of the Working Party of the Ministry of Housing and Local Government is reviewed, followed by comments by several cleansing superintendents. The Report proposes a new classification of refuse for the purpose of deciding the powers and obligations of local authorities. One recommendation is to separate refuse according to the kind of premises from which it emanates: domestic, trade, or industrial. Thus, domestic refuse would be required to be collected free of charge, trade refuse would be collected but subject to a collection fee, and industrial refuse would not be required to be collected and could be subject to a collection fee.

67-0171
Bugher, R. D. Transportation systems. In L. Weaver, ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.73-86.

Various factors to be considered when designing a transportation system for solid waste disposal are discussed. The system must consider all elements from point of waste origin to final treatment. Present systems are briefly outlined, equipment is described and some costs given. Waste transportation aspects considered are: the characteristics of the transportation network used (trip time, reliability, safety, costs), type and amount of waste, feasibility of transforming wastes to facilitate transport, size of area served, spatial distribution of waste generating units, and operating authority for the system. Some statistics concerning these factors are given for the Washington area. Solutions to the waste transportation problem may be found in existing technologies of other fields, or by developing entirely new technologies. Various transportation systems are explored to discover their feasibility for waste handling. Included are: pipelines; pneumatic systems, cargo helicopters, railroads, barges, and trucks. Advantages, disadvantages, and some cost figures are given for each system.

67-0172
Candy plant contract confronts hauler with . . . 'sticky stinging mess'. Refuse Removal Journal, 10(7):15, 39, July 1967.

The service of the Wheatridge Disposal Co., Arvada, Colorado, is described.

Bought by Marion Gilreath 6 years ago, this refuse contract business expanded within 4 years to 3,000 residential accounts, and about 200 commercial ones. To handle this growth, the original equipment was replaced with two used rearloading packers. Now the firm employs two 20-yd and one 25-yd Gar Wood Load Packers on an International chassis. Residential stops are normally weekly, with a choice of curbside or carry-out service at $2 or $3 per month, respectively. For commercial business, Wheatridge employs about 200 rear-loading containers, 2 to 5 yd in size. These are handled by the Gar Wood lift attachments or by an electric winch for the larger units. Pickup frequency varies from one a week to 7-day-a-week service for busy restaurants. Measures for dealing with masses of candy (e.g. oiling the truck floors) and with bees are mentioned.

67-0173
Chicago drivers win 50 cent increase. Refuse Removal Journal, 10(3):26, Mar. 1967.

Drivers of private refuse disposal trucks in Cook and DuPage counties, Illinois, have won a 50-cent-an-hour wage and benefit increase over a 3-year period retroactive to October 1, 1966. On October 1, 1968, the wages will be $3.86 an hour.

67-0174
Collection team wins 9 percent wage hike. Refuse Removal Journal, 10(2):7, Feb. 1967.

A 9 percent wage and benefit boost was won by drivers and helpers employed by members of the New Jersey Municipal Contractor's Association. This means wage hikes of $619.84 a year for drivers and $526.76 for loaders.

67-0175
Contractors handle Golden Gate area from forty-niner days. Refuse Removal Journal, 10(5):14-15, 25, May 1965.

Golden Gate Disposal has 183 stockholders; all are active in a phase of the business: maintaining equipment, bill collecting, and public relations. The company has 105 pieces of equipment and is replacing open trucks with compaction vehicles. Most of the equipment is on International chassis with Allison Automatic transmissions. Most of Golden Gate's container operation is confined to the Golden Gateway apartment development which supplies its own containers. Golden Gate also maintains a building debris container service. Most commercial accounts put their refuse out at night for early morning collection. Paper and polyethylene sacks are easing the collection job. Cloth and old corrugated paperboard are salvaged.

67-0176
Convey refuse by vacuum. Refuse Removal Journal, 10(2):34, Feb. 1967.

A London high rise will use a Swedish system called 'Centralsug' that is vacuum sealed and through which refuse is conveyed by suction. Refuse accumulated in the vertical chute is drawn by pressure through a horizontal pipe to a central collection point. Turbo-extractors are used to create a vacuum in the horizontal pipes. When one chute has been cleared, the valve closes and the next chute is dealt with.

67-0177
Crew of nine for S. African trucks. Refuse Removal Journal, 10(11):42, Nov. 1967.

The refuse collection service of Welkom, South Africa, is described. Instead of five top-loader trucks used previously, two British Paxit Mark II compression-type trucks and a Dennis Paxit IIIA continuous loader are used. A crew generally consists of a European driver and 8 to 10 native loaders. Four English refuse bodies, purchased in 1936, are also used but have been modified to collect garden refuse and to haul 1,000-gal water tanks for roadwork. Rubbish collected varies from light and compressible in the business district, to heavy ashes collected from residences in the winter. Welkom's two dumping points are located near the east and west city limits.

67-0178
Critchley, H. F. The report and the smaller authority. Public Cleansing, 57(8):418-440, Aug. 1967.

The Report of the Working Party is reviewed, followed by a discussion by several cleansing superintendents. In the Report, the use of polythene bins for domestic refuse storage was recommended, as was the weekly washing of removal vehicles and the use of bins for refuse collection.

67-0179
Dair, F. R. Vehicle Capacity--time, crew size, costs. Refuse Removal Journal, 10(8):6-8, 10, Aug. 1967.

The classical approach to estimating cost is division into labor, equipment, and materials. In refuse collection, materials are free. Householders in Los Angeles County place refuse in containers at the curb to be picked up once a week. Labor cost is $6.35 per hr for drivers, plus $5.40 per hr for each additional man. Amortization expense was based on 6 years straightline depreciation without interest and with no salvage value. Collection cost per ton was obtained by dividing the total hourly cost by the collection rate. One approach to the hauling problem is to transfer the refuse from the collection vehicle to a bulk-hauling rig and allow the collection vehicle to return to the route. A transfer station in South Gate, California, has been operating since 1957. This station uses the direct-dump system with the collection vehicles dumping from a raised platform into transfer trailers parked below. A representative cost for a municipal operation would be approximately $1.25 per ton. There are graphs and tables relating vehicle and labor costs and transfer versus direct haul.

67-0180
Danforth, H. L. Refuse trains--'better, faster, safer'. American City, 82(11): 102-104, Nov. 1967.

The refuse train system of combined garbage and trash collection in Tucson, Arizona, is described as highly successful. Tucson's 245,000 residents are served by 26 LoDal 'mother' trucks (28 cu yd apiece), 61 International Scouts, and 157 4- and 5-yd train containers (also called toters). Most of these units operate as parts of task forces, but a few are held in reserve. The operation of one typical task force, which consists of a foreman, two LoDal trucks with drivers, and four train units with a Scout Vehicle and three train containers, is detailed. The task force picks up about 130 tons of refuse per day. Daily operating costs of a task force total about $640. Of this, $180 is for equipment, $376 is for labor, and $84 covers fringe benefits. For twice-weekly service, this totals about one dollar per month per unit served. Proper planning of routes and the time needed to get to the disposal area, are critical factors in the program. The operators like it because they say it is better, safer, and faster. The administration likes it because production per man-hour is higher, vehicle operating costs are lower, and it is flexible. The public prefers it because it is quiet and efficient, and trash does not have to be separated from the organic, decayable garbage.

67-0181
Detachable, bin-type body. Refuse Removal Journal, 10(12):41, Dec. 1967.

A new residential refuse-collection vehicle called EVO, and marketed by Lodal, Inc., is described. It features a detachable, container-type body and a 1-cu-yd loading hopper forward of the body. A hydraulically actuated compactor plate or platen compresses the refuse from this hopper into the detachable body. When the body is filled, the operators go to a centralized site, detach the full container body and receive an empty one. This exchange takes 2 to 3 minutes. The filled containers at the centralized site are then deposited into a transfer-truck unit which discharges the containers into a compactor body, available in 21-, 25-, or 30-cu-yd capacities. One transfer truck with one operator is said to be able to service from 4 to 8 collection vehicles. Thus, the collection vehicles can stay on their collection routes almost continuously. The specifications of the collection vehicle are listed. Two operators are needed for one vehicle.

67-0182

Dumpster Dinosaur. Waste Trade World, 110(11):16, Mar. 18, 1967.

The Dumpster Dinosaur, supplied by the materials handling division of Powell Duffryn Engineering Co. Ltd., handles gross loads up to 11 tons on a four-wheeled 16-ton GVW chassis. The truck draws the container directly on guide rails on the vehicle, and a load can be taken up in less than 3 minutes without the driver leaving his cab. After a pick-up operation, the Dinosaur performs like a normal road vehicle. A 13-ton model is also available on a six-wheeled 22-ton GVW chassis. Details may be obtained from the firm at Cambrian House, Maindy, Cardiff.

67-0183

Fairbanks, G. B., and A. I. Price. Seattle's new transfer station begins operating at full capacity on opening day. APWA Reporter, 34(6):3, 8-11, June 1967.

Seattle's new transfer station began operating at full capacity on opening day, September 28, 1966. This was due in part to the fact that two of the three landfills replaced by the transfer station had been overfilled for almost 6 months, and also to the fact that equipment and methods were standard wherever possible. The planning, compaction mechanism, traffic circulation and storage, construction, trailers, the unloading system, and the truck weighing scale system are described in detail. During the first 5 months of operation, this new system has proved more than satisfactory. Eight hundred tons of refuse can be handled during a 24-hr period. The lightweight principle chosen for the truck tractors and refuse trailers has permitted consistently economic payloads. The truck weighing scale system believed to be one of the most completely automated systems in use for this type of operation, has, for the most part, been highly satisfactory. It will take more time to evaluate the traffic circulation layout. To operate the station on a 24-hr 7-day-week basis, 15 men per 24-hr period are required. Over 55,000 tons of refuse have been handled during the first five months for a disposal charge of $3.50 per ton. A diagram of the layout of the tipping level of the station is provided.

67-0184

5,000 Kuka waste collecting trucks. Staedtehygiene, 18(12):IV, Dec. 1967.

Keller and Knappich, GmbH, Augsburg, Germany, has delivered its 5,000th waste collecting truck. The vehicle is equipped with an electric motor in addition to the combustion engine. This electric motor drives all accessories during the loading of the vehicle. The waste is lifted into a rotating drum where it is mixed, crushed, and compacted. This method is space-saving and prevents fires and insects. The truck is exported to 47 countries. (Text-German)

67-0185

Gill, J. A vote for good service. American City, 80(5):96-97, May 1967.

Albuquerque residents would rather have their refuse collection rates raised from $1.75 to $2.25 a month than suffer the inconvenience of reduced service (placing containers at the curb). With the additional money, they raised crews from four to six men per truck. Six more trucks were added. They plan to buy uniforms for the men and one tractor and one scraper for landfill improvement.

67-0186

Good, I. L. Outsize-trash collection proves popular. American City, 82(1):35, Jan. 1967.

Bethlehem, Pennsylvania, has a city owned sanitary landfill, but refuse is collected by 29 private haulers who charge an additional fee for furniture and other large objects. Consequently many people accumulated such trash in their homes. To prevent this fire hazard, the city rented two 23-ft-long trailers for 60 days and had 60 stops in strategic locations in the city. Citizens were instructed to bring all trash to the trailer for disposal. A fireman prevented dumping of organic material and garbage.

Collection and Transportation of Refuse

67-0187

Hamelin, G. H. Propose train haul to desert landfill. Refuse Removal Journal, 10(3):10, 29, 46, Mar. 1967.

The San Francisco Bay Area plans to haul refuse by train to a landfill site in the presently unused desert wastelands near California's eastern border. Transfer stations are to be operated at 10-mile intervals along existing railroads. In the morning, a train of 70 to 90 empty cars is cut into two parts at Fremont. One goes to San Francisco and the other to Richmond to commence loading. Each progresses toward Fremont. Then, both parts joined, the entire train proceeds to the site 350 miles distant and returns on a 36-hr cycle. Collection agencies will dump their wastes into District-owned transfer stations and pay an established fee per ton. Revenue is possible from salvage operations. If economical, a composting operation could be carried out at the site with inexpensive return haul. The railroads are in existence; the desert is there--unused and waiting. There should be no objections and the dump can be conducted in an aesthetic and sanitary manner.

67-0188

Haul-it-yourself depots in New York. Refuse Removal Journal, 10(9):68, Sept. 1967.

New York City's Sanitation Department has set up 19 depots where persons may deposit rejected bulky objects. General household or commercial wastes may not be included. Open from 8 am to 8 pm all week, they have been established in order to discourage householders from depositing bulky refuse on sidewalks, vacant lots, fringes of parks, and other locations. To date, unwanted articles have been left at the rate of 50 truckloads a day. The Department also has a service where persons may telephone to have outsized junk picked up free of charge at a convenient time.

67-0189

Hauler shows operating cost rise of 23 percent in three years. Refuse Removal Journal, 10(2):39, Feb. 1967.

A California contractor, Municipal Disposal Service, Inc., requested a $1.25 per month increase in his individual collection rates since operating costs have climbed 23 percent during the last 3 years. The hauler also asked for a 10-year contract with a 10-year option. To give every stop a uniform type of service, the company also gives a free 55-gal rubbish container with handle and wheels to every customer.

67-0190

Haulers handle hub city routes since 1933. Refuse Removal Journal, 10(9):30, Sept. 1967.

Boston, one of the first municipalities to provide for the collection of solid wastes by contract, began such collection in 1910 with about one-half of the city districts converted to contract collection in the following 20 years. In 1933, a study recommended that refuse from the entire city be collected by contract, and by 1950 the entire city was covered by private haulers. At present, Boston is divided into 11 collection districts with contracts awarded yearly to the lowest responsible bidder. During 1966, the total cost to the city for contract collections was $2,461,798, representing a per capita cost of $4.00 per year or a unit cost of $10.00 per ton. Field inspectors check on contractors' performance. Collections in most of Boston are weekly, with separate collection of rubbish and garbage. Garbage is collected twice weekly in June, July, and August, and some older areas of the city with limited storage areas have more frequent collections. An Anti-Litter Campaign is conducted yearly, with TV and radio coverage as well as placards and decals on collection equipment.

67-0191

Hoesch, K. Miscalculations in the economy of waste removal systems. Staedtehygiene, 18(12):288-289, Dec. 1967.

An economic system for transporting waste to the incinerator plant is essential in keeping overall costs low. Two waste transportation systems are compared as to their economy. In the first system the waste is collected by a truck with a removable container and transported to the railroad station where the full container is removed from the truck and placed by crane onto a flatbed car.

After a number of waste containers have accumulated at the station the train brings them to the incinerator plant. The waste containers are emptied directly into the furnace, thereby circumventing intermediate storage of waste. Waste from communities near the incinerator plant is transported by trucks to the plant. Refuse from areas which are not located near a railroad station is emptied into the standard railroad containers which are then loaded onto heavier trucks and driven to the plant. The second transportation method brings the entire waste by railroad to the incinerator plant. Large cars (type Talbot, volume 102 cu m) are used for this purpose, thereby eliminating the exchange of containers. A detailed cost comparison of the two methods is given. A table, in which the entire waste disposal costs of several cities are listed, proves that the second method is more economical. (Text-German)

67-0192
Home service: yes but not too much. Refuse Removal Journal, 10(3):18, Mar. 1967.

The Barrington Trucking Company picks up trash even if not left in the agreed-upon place. Palatine, Illinois, trustees fear the extra service may increase collection cost.

67-0193
Hubiak, M. City yard features island concept. Public Works, 98(1):94-95, Jan. 1967.

New facilities are described which will accommodate equipment maintenance, water supply, street cleaning, refuse collection, and office activities in Covina, California. Plans call for a 13,500-sq-ft garage building and a 15,000-sq-ft combined warehouse and shops building for the new City Yard. A concrete apron between the buildings will provide a common outdoor work area. A parking area and an office building are also planned. Since the City Yard is located in a residential area, the island architectural design was used to reduce noise and to hide the working of the yard from view. Equipment in the garage includes two 10,000-gal underground gasoline tanks, a 10,000-gal diesel fuel tank, and a monorail with a 4-ton hoist. Cost of the structure, excluding shop equipment, was $8.30 per sq ft.

67-0194
Install vacuum collection for $750,000. Refuse Removal Journal, 10(8):12, 45, Aug. 1967.

Westminster has approved $750,000 for the Swedish vacuum refuse system called Centralsug for apartment houses. Waste thrown into a chute lands in a container 1 cu yd in size. About 6 seconds are allowed for the container to empty. The valve is closed. After shutting, it provides an effective seal for the necessary vaccum in the transporter pipe through which the refuse then travels. The pipe can be up to 24 in. in diameter with wall thickness up to 5/16ths in., and up to 1 mile long. The refuse travels at speeds of up to 90 ft per second. The storage silo is almost 35 ft high since the refuse must be discharged into it at its highest point. The vacuum in the system is provided by high speed turbo air exhausters driven by 110-kw electric motors. Refuse is removed at least once a day. Before the air enters the exhauster turbines from the transporter pipes, it passes through six filtration chambers, each approximately 4 ft in diameter and containing 60 cotton bags reinforced internally with wire coil. Dust collects on the outside of the bags and is removed by shaking. In Sundeberg, Sweden, the central storage silo is connected directly to the incinerator. The Centralsug system is also described in the February, 1967 issue of Refuse Removal Journal and the November 11, 1966 issue of Municipal Engineering.

67-0195
Jackson, D. W. Unusual marriage! Public Cleansing, 57(5):254, May 1967.

The S. and D. 50-cu-yd Pakamatic continuous loading refuse collector body on a Karrier Maxiload 14-ton G. V. W. chassis illustrates the tendency for bodywork to become available on a much wider chassis range. The standard Rootes

Group Cab has been modified by S. and D. to accommodate a seven-man crew, easily accommodated on the 176-in. wheel base model. The Maxiload also has several features, like power steering, heater, padded sun visors, hand brake, and adjustable drivers seat.

67-0196

Jackson, P. Refuse container-train collection system results in savings. Public Works, 98(2):74-75, Feb. 1967.

Alice, Texas, (population 22,500) switched to a container-train collection system in 1964. Businessmen had been allowing overflow garbage to gather in the alleys downtown. Alice bought a Dempster Brothers Dumpmaster Model DP45 24DB, a front-loading collection unit. Containers are placed in the downtown area mounted on wheels. When full, the container train calls the Dumpmaster collection unit by two-way radio to arrange a meeting for emptying the train. The city will be saving $64,000 in the first 6 years of operation. Ninety-five man-hr per week are saved. Gas and oil savings are substantial due to reduced number and size of vehicles. The trains can move faster and get into smaller alleys than packer trucks.

67-0197

Japanese city adds mechanized system. Refuse Removal Journal, 10(11):4, Nov. 1967.

Chiba, Japan, a rapidly growing industrial city of 370,000, has developed a mechanical refuse collection system. It combines the action of a collection truck with a crane, and a new type of container. The crane used in the operation is the Kyoci Unic Hydraulic Lorry Crane. The latter is located in appropriate places, such as under apartment building chutes and below ground levels in high-traffic areas. The crane lifts the bin, empties its contents into the vehicle, and returns the receptacle to its original position. A sprayer on the truck can be used to disinfect the container. The bin, which is made of steel, has the capacity to hold refuse generated by 40 typical households. It has an upper cover that is opened when refuse is deposited, and the bottom can be opened automatically while being handled by the crane. The latter is equipped with a double drum hoisting mechanism, hydraulic telescoping boom, and a revolving slewing mechanism.

67-0198

Jenson, E. J., and H. S. Ellis. Pipelines. Scientific American, 216(1):62-70, 72, Jan. 1967.

A brief history of pipeline building, the advances in technology which have increased their efficiency, and possible uses of the structures are presented. The first pipelines were crude cast-iron structures that leaked badly. In recent years, thin walled pipes have been developed that are up to 42 in. in diameter and can withstand pressures up to 100,000 lb per sq in. These advances have increased the popularity of transporting products in pipelines, and now there is much work being done on the transmission of solids through them. At this time most of the solid matter is transported in the form of slurries. In some instances this causes some wear and tear on the pipes, necessitating additional upkeep, but on the whole this has been found to be a minor problem. Recent experimentation has shown that many types of cargo could be transported if sealed in capsules. Cylindrical capsules move through pipelines very easily, especially if their density is nearly the same as the transporting liquid. Very little added pressure is needed to move them. Spherical capsules can also be transported; even if they are heavier than the liquid, they roll very easily along the bottom with little friction. Capsules are less corrosive to the pipeline than slurries, obviate the need for separation of solid and liquid, and do not require a great increase in pumping power.

67-0199

Jung, R. Flow losses in 90 degree deflections during pneumatic dust transport. Brenstoff-Waerme-Kraft, 19(9):430-435, Sept. 1967.

Experiments were made to determine the hydraulic pressure losses when air containing suspended particles flows through flow deflectors of various shapes, i.e. either of circular or rectangular profile with a 90 degree angle, segmented, or round with different curvature radii. The measurements were made at air velocities exceeding 25 m per second by adding the dust to the air stream, passing the suspension through the test section with the deflector, and then removing the particles by a cyclone and reintroducing them into the air stream. The hydraulic loss coefficients are given for

24 different deflector geometries. It is concluded that the obtained results can be used only when the flow upstream and downstream from the deflector is fully developed. For a transport system with short, straight tubes, the deflection losses cannot be defined. Coal dust and quartz dust gave about the same values, so that the hydraulic losses seem to be independent of the type of dust. (Text-German)

67-0200
Kane, W. C. Development of a municipal refuse collection system. Colorado Municipalities, 43(10):248-249, Oct. 1967.

Loveland, Colorado, considered three alternatives for refuse collection: (1) Ceasing city collection and leaving collection to private haulers would allow each householder to obtain the type of service he wants; the cost, however, would be high, and the city would have no control. (2) Establishing a mandatory collection system under a contract with a private firm eliminates the need for the city to purchase equipment; however, the cost to the householder would be higher since the contractor must make a profit. (3) A mandatory collection system operated by city personnel could be financed from the general fund so no fee need be charged. However, taxes would be increased; even businesses and industries would pay. Each householder can be charged a set fee to cover the operation. The city would collect from all areas on a regularly scheduled basis. Since there is to be no profit, there is less cost. Complaints can be handled better with complete city control. Loveland decided on weekly mandatory collection, operated by city personnel. Refuse was to be put in containers not exceeding 32-gal capacity. Each citizen would be billed $1 a month. Two 20-cu-yd packer bodies and a 16-cu yd packer were adequate to cover the city. Each truck was to cover 24 blocks per day—making 288 stops. After 2 months of operation, the city showed a net profit of $1,300.

67-0201
McClenahan, D. C. Selection of equipment for refuse collection operations. In Proceedings; Second Annual Meeting, Institute for Solid Wastes, Boston, Oct. 3-5, 1967. Chicago, American Public Works Association. p.26-39.

There have not been any significant changes or improvements in collection equipment for many years. Equipment selection involves consideration of several factors: surroundings in which the work is performed, safety conditions, the abuse and damage equipment must survive, the degree of automation desired, the physical demands the equipment places on the worker, and labor conditions. Specifications for equipment should be written by the purchaser and not by the truck dealer. It is important not only to see a demonstration of equipment but also to give it a tryout. A reference check should be made with other users of the equipment. The disadvantages of buying from the low bidder are considered. Equipment cost should be judged on repair parts prices, downtime, and life of the equipment as well as bid price.

67-0202
Marriot, J. Cost of refuse collection. Surveyor and Municipal Engineer. 129(3912):65-66, May 1967.

This article is comprised of extracts from a report given on labor, costs, and administration of refuse collection. In analyzing cost, it was found that there are three major factors involved: labor, transport, and equipment. Specific problems of each area are discussed. Main points of the report are: the need for more efficient house-to-house collection; classification of refuse according to its source; the need for local authorities to take the responsibility of refuse collection to the satisfaction of the private citizen; and the selection of vehicles for the type of refuse to be carried.

67-0203
Marriott, J. The report of the Working Party on refuse collection. Public Health Inspector, 75(10):405-408, July 1967.

Results of a questionnaire sent to local authorities in 1963 and standards for service set by the Working Party are given. Domestic collection is free, but commercial and industrial premises are charged a fee. Curbside collection is used at 15 percent of premises but involves hardship for the householder. Step collection (the collector transfers contents of a bin into a portable receptacle to avoid a double journey to the premises) is in operation at 21 percent of the premises. The Working Party requires that either bins be carried out and returned to premises by collectors (presently practiced at 30 percent of rural and 60 percent of urban premises) or that paper sack systems be used. The local authority should provide refuse storage receptacles. Rear loaders or dustless loaders should be used. Collection should be at least once a week. Wastes from food restaurants should be removed twice weekly. Bulky household refuse should be collected free. In England, nearly 6,000 out of 33,000 manual workers employed for collecting are in rural areas. The social stigma attached to the job, which causes a high turnover rate, must be removed or minimized by improved working conditions. The estimated cost of service in 1965 to 1966 was about ₤45 million. If the Working Party's recommendations are fully implemented, expenditures will be 20 to 25 percent higher.

67-0204
Mexico City buys 135 diesel trucks. Refuse Removal Journal, 10(3):32, Mar. 1967.

One hundred and thirty-five diesel-operated Pak-Mor refuse trucks will go into service in Mexico City to replace vintage trucks now in use.

67-0205
Millard, R. F. Technical aspects of the report. Public Cleansing, 57(8):416-418, Aug. 1967.

The future effects of the predicted changes in refuse volume and density, as presented in the Report of the Working Party, are reviewed. In 10 to 15 years' time, the average amount of household refuse would be about 5 cu ft per household each week at a density of less than 2 cwt per cu yd. These figures mean either an increase in frequency of collection will be needed or a larger number of bins. Since bins larger than 3.25 cu ft are too unwieldy, and the ordinary metal dustbin does not meet the required standard, plastic bins are recommended. These bins should be supplied by the local authorities in all cases. A once-weekly collection is recommended for food shops, hospitals, hotels restaurants, and other places where refuse contains a high proportion of perishables. The recommended collection vehicles are two-way tippers and continuous loaders, the former for bulky refuse and the latter for general refuse collection. The Working Party thought the local authorities should accept responsibility for cleaning bulk containers, which cleaning should be done at least once a month. It was also felt the law should require developers to provide adequate storage accommodation before planning permission was granted.

67-0206
New York hassles with equipment bids. Refuse Removal Journal, 10(2):14, Feb. 1967.

The Department of Purchase and the Department of Sanitation of New York are working together to bring about competitive bidding on refuse truck bodies and specifications that would enable American-made tires to compete in bidding with the French-made Michelin tires.

67-0207
Olds, J. Pipelines to transport organic wastes. Compost Science, 7(3):3-5, Winter 1967.

A recent trend is the use of pipelines to move solids in slurries. The flow pattern maintains a layer of clear liquids between the solid material and the wall. Organic ores (garbage, sewage sludge, and manure) could be taken to central pulverizing stations to make them physically uniform and ready for pipeline journey. Garbage in Stockholm, Sweden, is thrown down a chute and lands on a valve which also serves to seal off the vacuum which exists in the underlying duct during removal periods. It is carried to a hopper which is directly connected to an incinerator.

67-0208
166,000 stops in San Francisco. Refuse Removal Journal, 10(5):24-25, May 1967.

Sunset Scavenger has 166,000 customers with about 112,000 being residential. It has 92 established routes plus specialized operations, including paper, wet food waste, and liquid wastes and uses 152 pieces of equipment. Sunset recently converted its billing system to the IBM403. Many householders in depressed areas try to avoid getting involved with waste collection and simply set their refuse near a neighboring home or take it to a city receptacle at a park. Sunset is currently working with the San Francisco Health Department to set standards for the containers at apartment locations.

67-0209

Outline rules for calculating taxable gross vehicle weights. Refuse Removal Journal, 10(8):38, Aug. 1967.

Tax on the use of a highway motor vehicle is based on the taxable gross weight. This taxable gross weight is the sum of the actual unloaded weight of the vehicle and of any trailers or semitrailers, both fully equipped for service, and the weight of the maximum load normally carried. The definitions of 'fully equipped for service', 'weight of the maximum load', and 'a highway motor vehicle' are discussed.

67-0210

Per capita volume increases when more pickups are made. Refuse Removal Journal, 10(10):18, Oct. 1967.

A study, conducted by Northwestern University and financed by the United States Public Health Service, revealed that refuse volume increases when stepped-up refuse collection frequencies are made. A survey showed that doubling the rubbish collections in Chicago's 17th and 25th wards caused the residents to dispose of about a third more material. Apparently increased service causes additional disposal of refuse.

67-0211

Petie, J. A. New trash train units acquired by Mesa Sanitation Department. Western City, 43(2):37, Feb. 1967.

The city of Mesa, Arizona, is serving 13,360 customers with three 16- to 20-cu-yd packers, one 30-yd transfer truck, 210 containers, and 6 econo trains. These econo trains each consist of a 3/4 ton, four-speed, limited-slip rear-end pick-up with a 4-cu yd container, and pull three 5-cu yd trailers for a total capacity of 19 cu yd per train. The city of Mesa also has a brush chipper and six 28-ft brush trucks. Due to the new equipment, manpower has been reduced 15 percent. It appears that there will be another 10 percent reduction and that the volume of pickup per man hour will increase about 5 percent.

67-0212

Pickup vessel quadruples weekly harbor debris take. Refuse Removal Journal, 10(11):20, Nov. 1967.

A harbor flotsam recovery boat, called the Port Retriever, has been put into operation by the Maryland Port Authority in the Port of Baltimore. It is a self-propelled barge equipped with a wire mesh basket attached to two hydraulically controlled arms. Operating in conjunction with the Retriever are two open scows, a push boat to move the scows, and a specially equipped truck to lift the loaded scows from the water and haul them to the disposal site. Total cost of the system is about $75,000, with the Retriever costing about $26,800. The Retriever, weighing 7.5 tons can accommodate up to 1,000 lb in a basket scoop and is proposed to quadruple the amount of debris collected from shipping areas. Previously, open whale boats with two men and hand scoops had collected some 15 tons of debris a week. The Retriever, designed and built by Bootle Barge Company of Liverpool, is operated by one man.

67-0213

Pipelines for solid waste disposal. Public Health Reports, 82(11):1029, Nov. 1967.

The University of Pennsylvania has received a $42,724 Public Health Service grant to explore the use of pipelines in the collection and transportation of garbage, trash, and other solid wastes from homes, industries, and farms to disposal sites. Data will be provided on the feasibility of pipeline systems similar to those used for moving slurries of pulverized coal and water. Such a system would reduce the costs of manually collecting solid wastes and transporting them by truck. Studies will be done with different refuse mixtures at varying particle sizes and concentrations to provide a basis for determining the extent to which characteristic movements of solid waste slurries in pipes may be similar to movements of other waterborne solids. Variations in waste sources, composition, and quanitities in terms of their significance for pipeline design will be studied. Information will be gathered on current volume characteristics of waste disposal. An attempt will be made to determine pipeline costs and to compare them with alternative conventional collection and transportation systems.

67-0214
Plan to study rail transport of refuse. Public Cleansing, 57(12):667, Dec. 1967.

The Solid Wastes Program in the U.S. Public Health Service's National Center for Urban and Industrial Health has awarded a grant of $178,200 to the American Public Works Association, for a project to investigate the feasibility and cost benefits of transportation of refuse and other solid wastes by rail from cities to abandoned strip mines and other land in need of reclamation. The project is expected to run for 3 years at a total cost of $468,800. The New York Central System, as well as cities throughout the country, acting through the Association's Research Foundation, will share in the cost of the project. Investigation will be made into the use of unit trains loaded exclusively with wastes; the type of cars and other equipment most suitable for solid wastes; and the regular scheduling of trains carrying solid wastes. The use of transfer stations in assembling trainloads of wastes, the desirability of containerizing solid wastes, and the adaptation of pressure loading and other new material handling techniques not yet employed for solid wastes will also be studied. The benefits resulting from such a program are twofold: providing a means of disposal for communities which are running out of solid waste disposal sites; and reclamation of waste lands into useful areas.

67-0215
Pneumatic waste collection. Sanitar and Heizungstechnik, 32(10):742, Oct. 1967.

Pneumatic collection of household wastes is the most hygienic and economic method. Stockholm, Sweden, is the pioneer in this field. Five apartment houses with 250 units have so far been connected with an underground pipe system which ends in a waste-collecting pit. The motors, dust filters, and automatic regulators are housed nearby. Housewives throw waste into the waste duct, where waste accumulates on the valve lid of the pneumatic system. At least once a day the motor of the pneumatic system is switched on automatically. The valve lid closest to the waste collecting pit opens by an electric impulse. The waste falls into the pipe system and is sucked by a strong air current (24 to 30 m per second) into the pit. The current passes a filter and escapes by way of a muffler into the open air. The first valve lid closes and the next one opens. The process is repeated until all waste from all connected apartment houses is sucked into the waste collection pit. Then the motor is switched off automatically. Bulky wastes proved to be no obstacle. The collection pit is connected with an incinerator. (Text-German)

67-0216
Poertner, H. 'Rail-Haul'. APWA Reporter, 34(9):6, Sept. 1967.

The $468,800 APWA Research Foundation project No. 67-1, 'Potential benefits of rail-haul as an integral part of waste disposal system', is outlined. The project's objectives are to develop the concepts for and demonstrate the feasibility of railroad facilities used as a satisfactory means of solid wastes disposal. A sub-objective is to reclaim presently idle lands for useful and productive purposes, even if such lands are located many miles from metropolitan complexes. The 3-year project, initiated April 1, 1967, is now fully staffed and underway. Project offices are located in Chicago's Museum of Science and Industry. Although the bulk of the funds required to finance the project have been pledged by the joint-sponsorship of ten units of local government, the New York Central System, and the U.S. Public Health Service through its Solid Wastes Program, additional sponsors are needed. Interested parties should contact the APWA Research Foundation.

67-0217
Preventing punctures. Waste Trade World, 3(16):14-15, Oct. 1967.

The problem of preventing punctures of truck tires under special conditions, such as in engineering facilities with metal cuttings on the floor, and in scrap yards and dumps, is discussed. Previously used rubber inserts fitted between the tire cover and tube were reasonably effective against blunt objects, but would afford little protection against sharp objects. A modification of this old idea developed by Moplant Industries is the Moplant 'P-R' Tire Protector. It consists of a cord reinforced insert placed between the pneumatic tire cover and tube. A special design has been developed to provide the correct degree of resilience combined with high toughness. An object penetrating the tire cover deflects the protector against the air cushion provided by the tube. Its inherent toughness together with its resilience makes it extremely hard to penetrate. It was found that nails were bent and frequently pulled out again as the wheel continued to turn, while smaller objects like glass and swarf were securely held between the cover and protectors.

67-0218

Private collection replaces municipal. Refuse Removal Journal, 10(4):42, Apr. 1967.

Private will replace municipal collection in Dover, New Jersey. It will be financed by general taxation. Service will be increased from once to twice a week.

67-0219

Quon, J. E., A. Charnes, and M. Tanaka. Refuse quantities and the frequency of service. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. F-5.

A study of two political ward areas in Illinois showed that the increase in weight collected as a result of twice a week pickup service in approximately one-third of the living units was masked by the decrease (year to year fluctuations) in weight of refuse collected from living units provided with once a week pickup service. The total weight of refuse collected from each of the wards remained essentially the same. Figures are given to support these statements.

67-0220

Rabins, M. Old Jerusalem updates its collection system. Refuse Removal Journal, 10(12):6-8, Dec. 1967.

The refuse collecting methods found by the Israeli government after assuming management are described. About 30 tons of refuse is removed from the old, walled, section every 3 days. Its density is very high due to a large proportion of organic wastes. Trash had been collected by hand in containers, transported by hand cart or donkey, and brought to three appointed collection locations before being hauled away by truck. The Jordanian Inspector of Health Service was given complete control of the old collection department, but the number of his employees was reduced from 300 to 108. Collectors in Old Jerusalem range in age from 20 to 70; none wear uniforms and many are unshaven. Haulers are paid about $150 a month while Israeli swampers make about $200. Israel expects to turn over all collection in Israel to contractors, although the first step is yet to come. Most refuse in Israel is collected in small containers, but 1.5 cu yd-bins have appeared recently. Fees for collection are avoided by the use of taxes, with merchants and manufacturers being taxed more than homeowners. Payment, therefore, does not vary according to the amount of refuse. New Jersalem uses 15 trucks daily, including two U.S. built rear-end loaders and four trucks with lifts. All chassis are manufactured by Leyland.

67-0221

Railroad will haul waste to abandoned strip mines. Refuse Removal Journal, 10(10):14, Oct. 1967.

The City of Philadelphia and the Reading Railroad are planning a joint household refuse disposal plan. The plan involves using Reading trains to haul Philadelphia refuse directly to worked-out strip coal mines located in upstate Pennsylvania. The plan calls for the hauling of 1,200 tons of rubbish daily, at a cost of approximately $5.74 per ton. This figure is cited as much less than Philadelphia is currently paying to burn its refuse. The refuse will be shredded at the two Reading depots before being moved. Prior to dumping, the base of the mine will be filled with a 15-ft layer of earth. Specified by State authorities, the layer is to seal the earth face seams and cover any coal seams. A 5-ft-thick buffer layer is to cover the vertical faces, and all shaft tunnel entrances will be sealed off. This is to prevent seepage and stream pollution. Surface run-off or contaminants will be prevented from draining into the mine by concrete pads. They will be laid out to slope away from the mine's edge. The cars will be unloaded at the pads, the refuse dumped and dispersed in 4 ft layers, and then covered with 2 ft of earth. Bulldozers will be used to compact the fill, and eliminate possible air or oxygen pockets. The Reading also reports plans to dispose of some 280 tons of incinerator ash residue from one of two Philadelphia plants.

67-0222
Record exhibition. Public Cleansing, 57(5):229-244, May 1967.

A display of the public cleansing equipment, sponsored by the Institute's Conference at Blackpool, will be exhibited at the Royal Lancashire Agricultural Society's showroom. The display includes: vehicles--collection, compaction, sweeper, cleansing and gritting; appliances and protective clothing--dustbins, polythene bags, chimney cleaners, waterproof and p.v.c. clothing, brooms, baling press, brushes and litter receptacle; and earth moving equipment--loading shovels, tractor shovels, crawler, tractor and tipper.

67-0223
Refuse collection--guide to a better service. Public Cleansing, 57(6):282-284, June 1967.

The Government's Working Party on Refuse Collection has handed in a report. This report contains many recommendations with over 60,000 words, numerous statistics, charts, and illustrations. The need to reduce noise from collection vehicles and associated equipment is discussed. Dustless loading systems with hinged lid bins are recommended. It is believed that a measure of standardization of refuse vehicles would lead to lower prices. Though several systems were studied in relation to refuse storage, the Working Party thought that dry chutes and bulk containers were satisfactory if properly designed and installed. The report is a guide to a better refuse collection service for everyone concerned.

67-0224
Refuse storage and collection; a special supplement on the report of the Ministry of Housing and Local Government's Working Party on refuse collection, 1967. London, Institute of Public Cleansing. 8 p.

A summary of the 1967 report of the Ministry of Housing and Local Government's Working Party on refuse collection is presented and the recommendations of the report are listed. Discussions of the Working Party's conclusions regarding classification of house, trade and industrial refuse, storage and collection methods, cost, defrayment and frequency of collection, planning refuse systems for new and renovated buildings, salvage, collection vehicles, administration, staff and personnel, and research, are included.

67-0225
Refuse storage and removal in city centres. Public Cleansing, 57(2):85-90, Feb. 1967.

The original system at Garchey Station used suction mains to transport refuse. However, because 1,200 flats were to be coupled to the Garchey Station, additional work and capital would be required to renovate the system. Therefore the purchase of a tanker of the gully emptier type was the most economical. Such a tanker was purchased by Sheffield for £5,600. Although it worked with the least loss in time, maintenance costs were high. A static press was then considered since it would be even more economical. The pros and cons of the Garchey System were then discussed. With a 4 m haul to the tip, a vehicle can collect 80 to 90 1¼-cu yd containers per day. Much material must be collected and disposed of outside the system. The system was very good for refuse collection from flats with long promenades. Although the object of the system is disposal on site, it has many drawbacks. Therefore further research must be undertaken. Mr. Stenton also suggested the use of containers to hold refuse before it is compacted.

However, he favors on-site incineration. The cost of gas for this system is 7d per flat per week and it is assumed at 1s 2½d per therm.

67-0226

Refuse transfer station cuts trips to disposal area. Public Works, 98(11):72, Nov. 1967.

Institution of a transfer station in Dearborn, Michigan, has cut the number of daily 50-mile round trips to a refuse disposal area from 65 to 17. The loads from the individual packer units are transferred to one of six 60 yd Hobbs Hyd-Pak transfer trailers at the transfer station. Packers back into the station at the upper level and discharge their loads into one of three hopper openings in the floor. Hydraulically-powered sliding bulkheads at the bottom of each hopper are controlled from a stationary panel near each hopper. The control panels also actuate an automatic packing cycle in the compaction trailers that park beneath the hoppers on the lower level. Stationary hydraulic pumps run by electric motors are attached by quick-connect hoses to compaction cylinders in the transfer trailers. Packer plates in the trailers exert over 111,000 lb to recompact the loads. Each trailer-tractor is also equipped with a hydraulic load ejection system for use at the final disposal site or in an emergency. It is anticipated that savings on vehicle maintenance, fuel, and manpower will enable the station to pay for itself in approximately 5 years.

67-0227

Refuse transport by rail in Holland. Public Cleansing, 57(2):74-77, Feb. 1967.

In the Netherlands compost is produced on a larger scale than in any other European country. The largest plant in Holland is owned by a private company--V. A. M., and produces compost for land reclamation, agriculture, horticulture, etc. In 1965, 2,200 tons of compost were used in the tulip region south of Haarlem. Refuse is brought in by large-scale rail transport. One city, Groningen (population 140,000) sends 43,000 tons of compost in 1,842 rail wagons. These wagons are specially designed for top loading and side discharge. Each wagon carries a load of 23 tons and can be automatically emptied in 30 seconds. Bulky refuse not suitable for compost is burned at the Groningen transfer station in a special incinerator.

67-0228

Replacement policy for public works equipment. Public Works, 98(4):76, Apr. 1967.

The replacement of equipment in Arlington Co., Virginia, is based generally on a length of service factor as follows: dump trucks 5 to 10 years; refuse trucks 12 years; pick-up trucks 7 years; passenger cars 3½ years; police motorcycles 4 years; police scout cars 1½ years; and police cruisers 3½ years. Operation of 11 new packer type refuse collection trucks costs 53 cents per mile, including a reserve for replacement. In comparison, the older trucks were reported to have cost 72 cents per mile.

67-0229

Scottish views on Working Party report. Public Cleansing, 57(12):645-654, Dec. 1967.

Three papers giving the Scottish point of view in regard to the Working Party report were presented at the autumn meeting of the Scottish Center of the Institute at Perth on October 4, 1967. They are titled: 'The application of the Working Party report on refuse collection to Scotland; 'Comments from the City's point of view;' and 'Comments from the rural authority's point of view.' The first paper deals mainly with new legislation required in Scotland to implement the recommendations of the Working Party. The second paper points out the difficulties encountered in a city if the Working Party's recommendations of continental dustless loading and the paper sack system of collection are instituted. The third paper describes the collection activities of the rural county of Perth and relates these activities to certain parts of the Report. A discussion period followed the presentation of the three papers.

67-0230

Seattle to change hauling procedures. Refuse Removal Journal, 10(9):82, Sept. 1967.

Seattle's Board of Public Works has recommended to the City Council several modifications in the procedures governing the municipality's system of refuse collection. Under the new scheme, the city will be divided into north and south parts, with each served by a different wastes management firm. This was deemed desirable for the maintenance of 'competitive environment'. The successful bidder will be required to provide service to all premises and furnish containers to housing projects, apartment dwellings and various other locations. The fees paid at present by contractors at city transfer stations and for material picked up under city contracts will be discontinued.

67-0231
Self-tilting container solves dumping problems. Tonindustrie-Zeitung und Keramische Rundschau, 91(4):142, Apr. 1967.

For simple and rapid dumping, self-tilting containers have been developed by the Karl H. Bartels Company, in Hamburg, West Germany. The container is balanced so that the center of gravity is shifted when it reaches the full stage. It can be easily picked up by a fork lifter or another kind of transporting unit. For dumping, the container can be unlocked from the driver's seat of the transporting unit. The container tilts by itself, empties its contents, returns to the upright position and locks itself into place. Apart from use in other fields, the container is ideal for dumping wastes. (Text-German)

67-0232
Seventh transfer operation since 1959 opens in Seattle. Refuse Removal Journal, 10(2):38, Feb. 1967.

The seventh transfer operation since 1959 opened in Seattle under a program aimed at eliminating 19 open dumps throughout the county.

67-0233
Smith, C. For efficiency try the 'task system'. APWA Reporter, 34(12):9, Dec. 1967.

The 'task' system, a study of each route during average weather conditions undertaken to establish a reasonable 8-hr daily starting and stopping point, is described as an approach for developing an efficient, economical refuse collection program. Allowance is made for rest periods and lunch time; also the human factors of age, health condition, and emotional stability must be recognized in calculating how much each crew can accomplish during a given time. The crew is then held responsible for collecting all garbage and rubbish at each collection point on the assigned route. The incentive for the crew is that they are paid for eight hours of work, while, depending on all the variables, they may finish in less or more than 8 hr. The advantages of the system are: (1) Householders are assured regular scheduled service. (2) Trucks are in traffic the shortest period of time. (3) Overtime pay is eliminated. (4) Concentration of collection units at the unloading point at the day's end is dispersed, as various units finish up at varying times. (5) Supervision of employees is cut to the very minimum.

67-0234
Solid wastes topic of No. Cal annual meeting. APWA Reporter, 34(9):12, Sept. 1967.

At a meeting of the Northern California Chapter of the American Public Works Association, G. H. Hamlin described a plan that would utilize a desert disposal site for the solid wastes of the San Francisco Bay area. He proposed the use of collection stations on both sides of the Bay, with a rail train picking up the waste, transporting it to a central point, and then hauling it to the disposal site in the desert. Specially constructed hopper cars could be used with hinged rubber sealed tops. Disposal rates might have to be raised; for example, in San Leandro they might be raised from $1.25 to $1.50 to accomplish such a program.

67-0235
Steep hills mean higher pickup cost. Refuse Removal Journal, 10(2):39, Feb. 1967.

The Mill Valley Refuse Service asks for escalated collection rates, which are based on how far a residence is above sea level, because the steep slopes are tough on men and equipment.

67-0236
Sumner, J. The storage and collection of refuse. In Proceedings; INTAPUC Ninth International Conference, Paris, June 26-30, 1967. International Association of Public Cleansing. p.5-78.

Results of questionnaires sent to 19 European and North American countries on house refuse collection are presented and discussed. Topics covered include: amount and composition of refuse, methods of refuse storage in individual houses and multi-family dwellings, water-borne systems, kitchen grinders, on-site incineration, pneumatic transport systems, storage and collection in new buildings, frequency, method and vehicles for collection, management and training, and research. No information on costs is given. Summaries of the reports from Austria, Belgium, Denmark, Finland, France, Italy, Sweden, the United Kingdom, and United States are given.

67-0237
Symposium on two-phase flow in pipes to be held in Philadelphia. ASCE [American Society of Civil Engineers] Newsletter Waterways and Harbors Division, 48(2): Nov. 1967.

A 3-day International Symposium on solid-liquid flow in pipes and its application to solid waste collection and removal is to be held in Philadelphia, March 4-5, 1968. The goal of the symposium is to bring together interested workers in the field of solid-liquid flow to discuss advances in solid transport through pipelines. The methods and techniques of applying this technology to solve some environmental problems, such as the collection and removal of the solid waste of communities, will be examined. Sixteen international speakers have been invited and the proceedings of the Symposium will be published.

67-0238
3 communities in New York consider municipal collection. Refuse Removal Journal, 10(11):24, Nov. 1967.

Three communities in Westchester County, New Rochelle, Yorktown, and New Castle, have begun studies to determine if collection at homes and businesses can be paid for from tax revenues or by special assessments. Several factors have contributed to the initiation of these studies. In the summer of 1967, an executive in one local contracting firm was arrested and indicted by the county on charges of trying to intimidate a competitor. Secondly, the June report of the U. S. Attorney General found that 90 percent of the trade-waste disposal in the county was handled by members of families long associated with the Mafia. This report also disclosed the number of private contractors was shrinking through consolidations. Since 1964, the county has lost six carting firms, while the population has increased from 30,000 to 870,000. Most of the contractors left (about 25) are 2- or 3-truck firms.

67-0239
Trash trains--the unit train that could. Environmental Science and Technology, 1(5):371, May 1967.

A grant was awarded to the American Public Works Association to investigate the feasibility and cost benefit of transporting refuse and other solid wastes by rail from cities to abandoned strip mines and other land in need of reclamation.

67-0240
25-day strike by city workers ends. Refuse Removal Journal, 10(3):28, Mar. 1967.

The York, Pennsylvania, City Council has agreed to give workers a raise--drivers from $88.50 to $102 and loaders from $85.50 to $99 per 6-day week.

67-0241
Union seeks wage hike in New York. Refuse Removal Journal, 10(7):33, July 1967.

The president of the Uniformed Sanitationmen's Association has warned that sanitation men in New York City would soon begin negotiations with the Department of Sanitation for a large wage increase. Demands for increased productivity combined with 'poor equipment and lack of maintenance' have caused overwork and safety problems, he claims. The group recently won a $450 annual raise and a 20-year pension plan.

67-0242
Vanderveld, J. J. Success keyed to man on truck. Refuse Removal Journal, 10(4):12, 37, 42, Apr. 1967.

Advancement in National Disposal is strictly on merit. The man on the truck must be motivated. He has special training routes which have at least one of every variety of collection problem he is apt to encounter. Wastes have to be separated and properly stored to avoid collection and disposal of valuable property by mistake. Some industrial waste materials require special handling, open transport, and disposal.

67-0243
Wage agreement averts stoppage. Refuse Removal Journal, 10(1):10, Jan. 1967.

Agreement between industry and union negotiators averted a city-wide strike against New York City's private contracting firms which would have halted collection. The drivers and helpers, who handled more than 60 percent of the city's refuse, won $9 more per week for the first year, $4 more for the second, and $3 more during the third. Companies agreed to raise contributions to the pension fund from $7 to $9 per week per man. Employers agreed to raise contributions to severance pay fund from $2 to $3 per week per man.

67-0244
Warns of fires in collection trucks. Refuse Removal Journal, 10(12):42, Dec. 1967.

A private contractor in Elizabeth, New Jersey, warns that fires in refuse trucks may lead to increased city hauling costs due to increased insurance and labor rates. Combustion in the refuse is attributed to residents leaving hot ashes, burning charcoal and volatile liquids in the refuse. Combustion damages the hydraulic apparatus and sears the truck body. Thus far, no operators have been injured in any of the fires, since the load is usually dumped into the street for firemen to extinguish the blaze.

67-0245
Western Pacific Railroad planning a refuse express. Refuse Removal Journal, 10(9):18, Sept. 1967.

Western Pacific Railroad has been working on plans to set up a daily express run from the Bay Area of San Francisco to the Nevada desert. These plans were initiated when G. H. Hamlin published an article in the Refuse Removal Journal of March 1967, suggesting that 70-car trains, sealed so they will not leak or smell, could haul refuse from transfer points on both sides of the Bay. Unproductive desert could thus be made usable with sanitary fill. The President of the Chamber of Commerce, however, indicates that incinerators were recommended instead for San Francisco in order to keep the solution of the refuse removal problem at home and within local jurisdiction. For example, a train strike could leave refuse piling up in San Francisco.

67-0246
Zapf, F., and H. Giles. Mammoth trucks and mini scooters. American City, 82(1):77-79, Jan. 1967.

Fifty cubic yard trucks serviced by two diminutive scooters each have lowered cost of refuse collection in Pasadena, California. One of the crewmen employs a magnesium tote box or a hand dolly where a long walk or steps prohibit use of scooters. The packer stops 125 ft from the corner. Collectors drive scooters up driveways. They dump refuse into a 3-yd hopper. The driver then raises this bucket over the cab to drop the load into the truck box. The packer ram compacts the load and the driver moves his truck ahead 250 ft. Prior to 1957 people either burned refuse in back-yard incinerators, illegally dropped it in ditches or hauled it to a dump. The city instituted a weekly collection of disposable rubbish.

DISPOSAL

67-0247
Bennett, E. R. The third pollution. Colorado Municipalities, 43(10):244-245, Oct. 1967.

Mixed refuse is 70 percent paper and rags. More than 80 percent of U.S. cities dispose of garbage in open dumps. Burning refuse in an incinerator destroys the material to ash and uses little land. But it initially costs $6,000 to

$7,000 per daily ton capacity. Operating costs range from $5 to $8 per ton. Waste materials in a sanitary landfill are compacted with a bulldozer and covered with 6 in. of earth at the end of the day. Landfilling costs $1 to $2 per ton of refuse. Composting is a natural biological treatment process in which refuse is converted to a useable end product under odorless conditions. Long columns or windrows produce a finished product in 6 weeks. Mechanical composts produce the product in one. Six of nine plants initiated before 1965 have been abandoned. The process costs $4 to $5 per ton of refuse.

67-0248
Bond, R. G., and A. F. Iglar. Hospital solid waste disposal in community facilities. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. D-3.

A study of hospitals in the vicinity of the University of Minnesota is in progress and includes surveys to determine quantities and types of waste released into the community, ability of the community to accept and dispose of this pathogenic or special waste, and the consequences of such disposal of solid wastes. Possible public health implications will be especially studied. A preliminary study showed that the solid waste contribution on a per-patient basis was almost 9 lb per day at a large public teaching hospital, and a little over 5 lb per day at a moderate-sized church-affiliated hospital. Corresponding values for volume were roughly 3 cu ft and 2 cu ft respectively.

67-0249
Black & Veatch, Consulting Engineers. Solid waste disposal study for Washington Metropolitan Region. Kansas City, Mo., Oct. 1967.

Results of an investigation of the current and future solid wastes disposal needs of the Washington Metropolitan Region and recommendations for meeting those needs are presented. The study was sponsored by the Northern Virginia Regional Planning Commission, the Metropolitan Washington Council of Governments, and the Maryland National Capitol Park and Planning Commission. The study covered the current status of solid wastes programs in the regional area: refuse qualities, alternative disposal methods, land requirements for disposal, inventory of potential disposal sites, transportation of solid wastes, recommended disposal programs, administrative and financing considerations, and sediment disposal. Topographic maps of potential landfill and incinerator sites and descriptive data on each site are given in an appendix.

67-0250
Briley, Wild & Associates. Inventory and analysis of existing water, sewer, and solid wastes systems in the Tampa Bay Region of Florida; Hillsborough, Pinellas, Manatee, and Sarasota Counties. Nov. 1967. 67 p.

The Tampa Bay Regional Planning Council has begun a comprehensive survey of the major utility systems in the Tampa Bay area financed in part through an urban planning grant from the Department of Housing and Urban Development. The purpose of the inventory is to provide a clear picture of the current status and present development of water supply, pollution control facilities, and solid wastes disposal. Maps and tables cover all systems in the counties of Hillsborough, Pinellas, Manatee and Sarasota serving 25 persons or more, but not including restaurants, schools, businesses or industries unless specifically noted.

67-0251
Briley, Wild & Associates. Regional solid wastes disposal facilities. In Inventory and analysis of existing water, sewer, and solid wastes systems in the Tampa Bay Region of Florida; Hillsborough, Pinellas, Manatee, and Sarasota Counties. Nov. 1967. p.49-60.

The growth of the refuse problem in the Tampa Bay Region is the result of rapidly increasing population and changes in marketing and merchandising methods. It is estimated that each person generates from 2 to 4 lb per day of refuse and wastes from industrial, commercial, and municipal installations, which together with yard and shrubbery trimmings increase this total to approximately 7 lb per person per day. Tampa and St. Petersburg both operate 500-ton-per-day incinerator facilities, Clearwater operates a 300-ton-per-day facility and St. Petersburg contracts an additional 100 tons per day to a composting plant. Other than these 4 facilities, all solid wastes in the Region are disposed of either through 23 approved sanitary landfills or in unauthorized dumping areas. Disposal sites and facilities, and public and franchised collection systems are summarized for each county.

67-0252

Briley, Wild & Associates. Conclusions and recommendations on regional solid wastes disposal facilities. In Inventory and analysis of existing water, sewer, and solid wastes systems in the Tampa Bay Region of Florida; Hillsborough, Pinellas, Manatee and Sarasota Counties. Nov. 1967. p.61-66.

It is recommended that large scale incineration, composting, pyrolitic decomposition, destructive distillation, and large-scale consolidated landfills be investigated. During the period before these large scale methods can be made operational, planning for continued solid wastes disposal utilizing the sanitary landfill method should include: acquisition of additional landfill sites, feasibility study of a centralized collection system with transfer stations, improvement of operational practices at existing disposal sites, programs to insure better measurement of the solid wastes being generated, and continued regional planning. An inventory and analysis of regional solid wastes disposal facilities and public and private collection systems are given.

67-0253

California county votes 875 acre site. Refuse Removal Journal, 10(3):39, Mar. 1967.

San Mateo County obtained 875 acres as a refuse disposal site which will be transformed into a park by the year 2000.

67-0254

Cochran, D. M. Solid waste—a Texas size problem for Texas. In Proceedings; Solid Waste in Urban Environments—a Community Action Seminar, Houston, Mar. 9, 1967. University of Houston. p.12-21.

The past and existing solid waste program, problems, plans for the future, and implementation of those plans under the Texas State Health Department are covered. The Department has had a municipal refuse program since 1944. From 1947 to 1954, Health Department personnel began actively contacting cities and assisting them in improving their refuse handling techniques. Since 1954, five demonstration series have been conducted on refuse handling. At present the municipal refuse program is a part of the Environmental Development Program which is made up of two sub-programs—vector control and urban planning assistance. Two sanitarians under the direction of an engineer devote approximately 80 percent of their time to the solid waste program. In addition, personnel in the six regional offices provide support. Aside from the large human population, there are an estimated 10,000,000 head of cattle with each cow producing an average of 13.5 tons per year of manure. Many sanitary landfills in the state are rapidly becoming open dumps. Rapid urbanization is occurring in 22 areas of the State, creating the problem of locating suitable land for proper disposal. One hundred and eighty-five counties do not have the services of a full-time local health department. The present advisory and educational program will be expanded and a Solid Waste Legislation Advisory Group formed. Field investigation personnel will obtain information for projections and plans for future needs of solid waste disposal. A study of production and characteristics of solid waste in Texas will be undertaken. Long term objectives of the program are to enhance conservation of natural resources, eradicate aesthetically unpleasant conditions, reduce rodent and insect vectors, and develop proper solid waste disposal facilities.

67-0255

Combines sludge and solid wastes. Refuse Removal Journal, 10(8):42, Aug. 1967.

According to E. R. Bennett, professor at the University of Colorado, combining sewage sludge and solid waste in one disposal system may cut disposal costs. He cites the average cost per household for sewer and trash service as $50 to $80. Where land costs are high, the trend is toward incineration of both refuse and sludge, even though the cost is relatively high, averaging $5 per ton for a large operation. Composting costs from

$6 to $10 a ton, but there is a problem finding suitable markets. Raw sludge averages 4 lb per capita, almost the same amount as the average daily production of solid waste. Cost per ton for refuse disposal is $1 to $6, with transportation and collection accounting for about 80 percent of the cost.

67-0256

Council considers Civic Act. Waste Trade World, 111(22):5, Nov. 25, 1967.

The Bradford Council has been considering various ways to implement the recommendations of the Civic Amenities Act. It was agreed that facilities should be provided so that people can take their bulky household refuse, such as old furniture, to the various dumps in the same way as they presently take garden refuse. The growing problem of disposal of scrapped cars was brought up with a definite proposal planned for the near future.

67-0257

Dallas faces open burning controls. Refuse Removal Journal, 10(10):39, Oct. 1967.

Since new air pollution laws may soon stop controlled open burning of refuse, Dallas will have to find a different method of refuse disposal. The City's fire marshall predicted that by 1975, local population growth will force the city to find new methods. Dallas officials are studying several plans, including one that involves dumping and burying trash in old gravel pits.

67-0258

Dodson, J., and H. Wallman. Research and development of a waste management unit for a manned space vehicle. Washington, U.S. Department of Commerce, Apr. 1967. 19 p.

A waste management unit (laboratory model) for use in a space simulator was designed, fabricated, and tested. The unit was designed to: support four men for 30 days; operate for five 30-day simulated missions; operate under weightless or normal gravity conditions; collect urine and feces separately but simultaneously while the user is in the seated position; and collect urine while the user is in a standing position. The unit, which is comprised of a single sphere, collects, dehydrates, and stores feces. This precludes the necessity of manual transfer of waste. Positive odor control is achieved with forced air flow.

67-0259

Dubos, R. J. Scientists alone can't do the job. Saturday Review, p.68-71, Dec. 2, 1967.

The necessity for scientists to advertise their activities in order to obtain public funds leads to extravagant claims concerning expected research results. Thus the public is encouraged to believe that scientists can solve all modern-day problems. Science must return to differentiating between what is proven and what is only hypothetical. In addition, accidental discoveries encourage the dangerous belief that planned research is worthless. However, Fleming would not have discovered penicillin had he not been conditioned intellectually to welcome the mold. Much scientific research is governed by social needs, and most scientists are attracted to problems which are fashionable, well-financed, and well-rewarded. However, scientists have been neglecting those problems most meaningful for modern human life, and science is becoming alienated from the rest of the social structure. In some cases, as in the study of agriculture, a neglected field of science will be developed as a result of social pressure. Social problems created by new technologies are not solved ultimately by counter technologies, but represent short-sighted adaptive mechanisms. Future technological proposals must be based on how they are likely to support attainment of accepted goals. Discussions of the sociology of science should be made public. In addition, responsible citizens should learn to recognize and evaluate social consequences of technology, and share in the decision-making involving scientific problems, thus restoring social coherence to the democratic society.

67-0260

Easier slag disposal. Modern Casting, 52(1):53, July 1967.

A materials handling system using a hydroseal pump is discussed for use in slag disposal. This fluid transport system quenches the slag to granular form and flushes it out to a disposal area. The highway department removes the slag free of charge for use on roads under icy conditions. The pitch of the pipe to prevent winter freeze-up is explained. The advantage of this system is that it eliminates dumping hot viscous slag and the manpower needed to remove it.

67-0261
Eastman, W. H. Solid waste handling by Federal installations. In L. Weaver, ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.45-49.

A description of the waste disposal activities of the General Services Administration, particularly in the Washington region, is given. Some costs are recovered by the sale of usable paper and scrap metal. Types of waste and disposal methods are briefly described. General Services Administration operates 20 incinerators in the Washington region. Flyash control is briefly discussed. Wet pulping and hammermill operations are used to dispose of classified wastepaper. A special 'one time' disposal problem was destruction of 2.5 million condemned field hospital injection sets.

67-0262
$8 million hazard in floating lumber. Refuse Removal Journal, 10(9):83, Sept. 1967.

Since there are 17 million cu board ft of rotting lumber in New York Harbor, which can loosen and float as a potential hazard to shipping, causing an estimated $8 million in repair costs to damaged ships, Commissioner Halberg has initiated an in-house pier removal program. Under this program ferry repair crews are to be utilized to demolish flat bed piers and cut off their pilings at the mud line. Using these crews rather than private contractors will save the city an estimated $300,000 for the demolition of three piers. Debris which has floated loose from New York City's shoreline is the responsibility of the Army Corps of Engineers, which spends $475,000 annually to pick up 600,000 cu ft of lumber from the harbor. In addition to tug boats and two barges, the Corps has several specially designed ships to do this job.

67-0263
Electric waste basket. VDI[Verein Deutscher Ingenieure]Zeitschrift, 109(4):154, Feb. 1967.

The 'electric waste basket' consists of a paper shredding machine on top of an ordinary waste basket. The shredder cuts letter sized paper sheets into 1.9 mm wide strips. Through a central opening other waste like cigarette boxes and orange peels can be put into the basket without being crushed. (Feinwerktechnik Schleicher & Co, Markdorf/Baden). (Text-German)

67-0264
Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. 180 p.

Preprints of the conference are presented. Five areas were covered: solid waste management; sanitary landfill; incineration; computer applications and new handling techniques; farm wastes, agricultural wastes and composting; and municipal refuse studies. Summaries of keynote addresses, preprint index, and author index are also provided.

67-0265
Estimate 12 million tons a year by 1980 in Southern California. Refuse Removal Journal, 10(11):38, 40, Nov. 1967.

Wastes disposal practice and prospects in Los Angeles County are surveyed. Based on a County survey and projections, this County will have produced by 1980 some 165 million tons of refuse, while the landfill sites available at the present time have a combined capacity of 270 million tons. In 20 years, however, the County will find the refuse disposal problem unmanageable unless appropriate steps are taken now or at least planned. Local officials would like to see individual contractors expand operations to keep pace with population growth and with the increasing rate of refuse production. By 1980 almost 9.5 million people will yield over 12 million tons of refuse a year. Incineration is not encouraged to reduce the bulk of refuse, since Los Angeles residents are very sensitive about air pollution and backyard burning was banned in 1951. Composting has practically no market. Landfill, with the use of more transfer stations, is thus considered the most practical method of wastes management for the County, although other techniques, such as sewer disposal, are not ruled out. The southern District of the county is in the most critical situation, with present landfill sites to be filled by 1970.

67-0266
Excess cut rock crushed and belted away. Roads and Streets, 110(7):24-27, July 1967.

The disposal of 3 million cu yd of waste rock and dirt produced in the construction of a shelf-road along a valley-side bluff near Wheeling, West Virginia, is described. The short segment of State Route 2 reconstruction is only 1.9 miles in length with three interchanges and will cost $10.1 million. At the south end of the job, both rear-dumps and bottom-dumps deliver the material to the trap of a chain feeder. The material is given one crushing by a Cedarapids double impeller impact breaker which takes rocks up to 4 by 5 ft and delivers material with a maximum size of 11 in. to a 48 in. endless conveyor belt. It transports 1,200 cu yd an hr along a 500-ft system over Route 2, railroad tracks, and between suburban dwellings to discharge bins for disposal by haulers to a waste site along the Ohio River. One and a quarter million cubic yards is to be belted off by this system. At the north end of the job, over 2 million cu yd is being toted by end-dumps into a large ravine on the upland side of the right-of-way which necessitates haulage up grades as steep as 22 percent. The fills will top out at 100 ft or higher than the finished grade. The project's haul averages 3,000 ft with the longest (up to 1½ miles) up into the high gully. Seven illustrations show the belt conveyor system, the earth movers, and the highway shelf along the river bank.

67-0267
Flavier, J. M., and V. Mactal. Rural waste disposal: a search for an approach. Journal of the Philippine Medical Association, 43(9):790-800, Sept. 1967.

Since the average farmer in the Philippines has not adopted the sanitary toilet in spite of the intensive and extensive efforts of the government health authorities, a study of rural waste disposal was undertaken. Farmers objected to the wooden unsealed toilets, because of the bad odors they caused, their high cost, bad appearance and the danger of falling through the opening. To correct this situation, a cheap, single, concrete, water sealed sanitary latrine was developed, which was acceptable to the rural population. However, the need for proper, consistent use of the toilet necessitated a fundamental health education campaign. This was done with a full awareness of the human factors involved in the processes of change and of the other problems of poverty, illiteracy and civic inertia. The success of the project is illustrated by the fact that at present 64.4 percent of all homes in 200 barrios have sanitary toilets. A number of barrios in the later stages of development have close to 100 percent installed toilets.

67-0268
Fun city strikes at pollution. Engineering News-Record, 179(19):68, Nov. 9, 1967.

A $110-million combination incinerator and sewage treatment project has been proposed for New York City that would eliminate 99 percent of the fly ash from its own exhaust and would complete plans to end the dumping of raw sewage in the city. It might also provide enough steam to retire a nearby power plant that has been a relatively heavy polluter. The project's interrelationships make it notable for more than its size. The treatment plant would have covered aeration tanks vented to the incinerator's firebox to provide air for combustion. Methane from the sludge digester would help fuel the incinerator and the incinerator's waste heat boilers could generate enough steam for internal operating needs and a large surplus, primarily for sale to Consolidated Edison which has agreed to buy at least $2.2 million worth of steam a year. Savings accrued from these and other efficiencies could recover as much as one-half of the plant's estimated $6 million operating costs. No date has been set for construction since funding has yet to be worked out. It is anticipated that as much as 60 percent of the funds for building the sewage plant could come from the State's clear waters act, but the incinerator's financial source is less clear.

67-0269

Furness, J. F. Disposal of household refuse in wet gravel pits. Public Cleansing, 57(5):255-259, May 1967.

In England and Wales about 14 million tons a year of refuse has to be dealt with. In the Greater London area alone, 3 million tons per year is collected, and this occupies a volume of about 30 million cu yd in the loose state. Of the 3 methods of disposal, tipping into water is dealt with. The composition of the water, however, undergoes a profound change due to the polluting effect of the refuse. There are several ways for dealing with aerial nuisance: establishing a biological balance by inoculation of culture; aeration of water during filling to prevent development of sulphate reducing organisms; chlorination; and treatment with sodium dischromate. Bacteria and organic matter are not found to persist in the underground water in the direction of flow for more than about 50 yd. Pits should preferably be started in October and should be filled to just above water level in a maximum of 7 months. Refuse should be pulverized before disposal because then it is more dense, reduces fly and rat infestation, does not need daily covering, and is not unsightly.

67-0270

Gazda, L. P. Solid waste—the most neglected form of environmental pollution. In Proceedings; Solid Waste in Urban Environments—a Community Action Seminar, Houston, Mar. 9, 1967. University of Houston. p.5-11.

The technological ingenuity that helped create this society and made it possible to produce and use things at an astonishingly rapid rate, must now face the task of figuring out how to dispose of the fruits of this labor without endangering human health and well-being or drastically marring scenic beauty. The $3 billion a year which Americans are paying for often health-hazardous waste disposal reflects only readily identifiable costs. A little less than half the $3 billion is for private sanitation services and the rest represents the cost of municipal refuse collection, processing, and disposal. This expenditure leaves unaccounted for such items as increased community water treatment costs, family medical bills, payments for pesticides, and exterminators to control waste-inhabiting insects and rodents. Solid waste disposal responsibility still is relegated to communities too small to support acceptable disposal operations. Except for the substitution of trucks for horse-drawn trash wagons, and the development of compacting equipment and a few improvements in incineration, solid waste management research in the United States is essentially that of the 19th century. Solid waste management suffers from a crucial shortage of technically trained personnel. Solid waste engineering is estimated to be as many as 30 years behind water and air pollution control. Many new solid wastes will be generated by the removal of pollutants from water and air. Some of these problems are being remedied through grants administered under the Public Health Service's Solid Waste Program.

67-0271

Get rid of the dumps. American City, 82(7):23, July 1967.

A newly created board will review solid waste disposal problems in Ohio and advise on the need for new legislation. The principal problems are open dumps, burning dumps, and dumps along streams which add to water pollution. The Health Department is expanding its solid wastes engineering staff to help local government agencies fight the problem.

67-0272

Gilbertson, W. E. The new program for solid waste treatment in the United States of America. Salud Publica de Mexico, 9(1):73-76, Jan.-Feb., 1967.

Remarks made at the Seminar on Environmental Health and Urban Planning briefly cover the United States' efforts toward effective elimination of solid waste problems. Of the seven general points in the program, established by the Office of Solid Wastes of the Public Health Service, air and water pollution campaigns and solid waste treatment are emphasized. Difficulties arise from the fact that new methods of treating solid wastes have not been developed for some years, and that responsibility has been shared by various political divisions.

It is considered that success hinges upon combating all aspects of the problem simultaneously, and upon finding entirely new methods of utilizing waste products. It is suggested that experience and technological advancements achieved by the United States might be helpful to the Mexican sanitation program. (Text-Spanish)

67-0273
Golueke, C. G., and P. H. McGauhey. Technology of solid wastes management. In Comprehensive studies of solid wastes management; first annual report. Sanitary Engineering Research Laboratory Report No. 67-7. Berkeley, University of California, May 1967. p.93-117.

Studies of the existing technology of solid waste management include the fields of incineration, composting, landfill, and salvage. Current incineration technology requires storage of raw waste due to uneven delivery schedules. A study is presented in which the refuse is first dried and then pyrolysed to produce products which are easily stored for use as future fuels. The economics of the plan appear favorable. Composting has largely been bypassed by both waste managers and farmers in this country in favor of quicker disposal methods and chemical fertilizers respectively. There is some market for compost in this country for luxury crops, but a change in the market situation is necessary for any success in composting. Landfill techniques have been studied previously, and it is pointed out that available land in the municipal areas is rapidly diminishing. Salvage markets exist now in metals, paper, and rubber. Glass and plastics were found to be of low salvage value, due to the many varieties requiring separation and the low resale value. Separation from household rubbish is generally inefficient except for metal cans which can be removed magnetically. Industrial recycling at the source reduces waste volumes and increases plant efficiency.

67-0274
Govan, F. A. High rise disposal problems. Refuse Removal Journal, 10(3):6-7, 36, 38-39, Mar. 1967.

There are five general methods for apartment house refuse disposal: placing in containers for collection; placing wet garbage in disposal unit and dry in a chute; compacting dry refuse on-site; placing in a sink unit; and placing in chute-fed incinerators. The central chute method meets the following criteria: convenience, flexibility, short-term storage, central collection, and low fire hazard. The hopper door must be adequate for charging refuse that is no larger than 2 ft in length and 14 in. in diameter and made of long sections with sufficient fire protection. It has taken an Act of Congress to make owners meet even minimum odor, pollution and reduction requirements in incinerators. Incineration is, however, the only system that reduces refuse to 30 percent of its original volume. A proprietary system uses a pneumatic ram to compact the refuse into paper sacks or plastic containers. It reduces volume to one-third of original volume, reduces storage, and produces an easy-to-handle package. However, it is critically dependent on electricity and needs strong paper bags. Heavy crushers have little applicability in apartment buildings. The storage space of an undersink bowl is limited and waste water may not be sufficient to flush the refuse. All but bulky wastes can be disposed of by sewage systems.

67-0275
Governor's Conference on Air Pollution draws variety of experts and suggestions. Pennsylvania Medicine, 70(12):12-13, Dec. 1967.

The Governor's Conference on Air Pollution, held Oct. 2 and 3, 1967 in Hershey, Pennsylvania, is summarized. One of the participants, Abraham Michaels, a solid waste expert from the Philadelphia Department of Public Health, suggested that the State government establish guidelines for refuse disposal facilities and organize training programs for people operating them. The cost of an incinerator for a community of 150,000 is between $2,500,000 and $4,000,000 and the cost of operation runs about $4 to $7 per ton of refuse burned. The per capita cost of incineration, including labor, maintenance, and capital investments, but not including cost of refuse collection, runs about $6 to $10 per year.

67-0276
Guarino, C. F. Sludge disposal by barging to sea. Water and Sewage Works, 114: R126-R127, Nov. 30, 1967.

Based on extensive investigation, Philadelphia decided to barge digested sludge from her northeast plant to sea. This program, initiated in 1961 by contracting for sludge transportion service, is described. During 1961 to 1963, digested sludge was pumped directly from the plant digesters to the barge docked at the northeast pier, a distance of 4,000 ft, and from there transported 110 miles to the unloading area. Traveling time to the area averaged 13 hr and unloading time at sea, pumping the sludge overboard, averaged 6 hr. During the first 3 years of barging, the digested sludge averaged 6.2 percent solids and in 1964 a dredge was purchased to enable the pumping of thickened lagoon sludge to the barge. Sludge containing 10 to 15 percent solids has since been pumped with little difficulty a distance of 2,000 ft to the barge at a rate of 3,000 gpm. The use of the dredge has reduced the number of barge trips and cut sludge barging costs. The second step in the program was to determine, on the basis of operating experience and costs, whether a barge should be built and maintained or whether the contract should be continued. Although barging by contract would be slightly greater than the annual cost if the city were to build and maintain its own barge, it was decided, however, all factors considered, to continue to contract on a 3-year basis, terminate lagooning of digested sludge at the southwest plant, and to provide sludge-barging facilities to the plant. A centrifuge station is planned to insure transportation of 10 percent sludge from the Southwest plant to the sea. It is felt that the favorable economics of barging to sea has solved Philadelphia's sludge disposal problem, particularly in view of the fact that it is one-third the cost of sludge incineration, which was being given strong consideration.

67-0277

Harden, D. T. Disposal methods and characteristics. In Location of solid waste disposal facilities in urban communities. M.S. Thesis, Georgia Institute of Technology, Atlanta, Aug. 1967. p.5-20.

The advantages, disadvantages, operating characteristics, and site requirements of various solid waste disposal methods are reviewed. While open dumping is the cheapest method of waste disposal, it has many serious limitations. Feeding garbage to hogs can be a profitable and safe operation if the garbage is cooked first. Sanitary landfill, which involves the orderly burying of refuse on a strict daily basis, has been used by more than 1,400 cities and counties for disposal and land reclamation. Satisfactory disposal can usually be accomplished for $1 to $2.50 per ton of refuse but generally costs in excess of $1.50 per ton for hauling refuse to the disposal site cannot be justified. Incineration costs generally range from $3 to $5 per ton of refuse burned and capital costs are also high. The costs of disposing of residues and installing air pollution control equipment must be added to the actual incinerator costs. Windrow composting costs only $2 to $3 per ton but large sites are required and there is no widespread demand for compost. Salvage operations have been made uneconomical due to falling markets and rising labor costs. On-site disposal includes garbage grinding, incineration, burial, and open burning. Additional methods include dumping at sea, grinding and disposal in sewers, and reduction of garbage and dead animals to grease and tankage.

67-0278

Harden, D. T. Planning for disposal facilities; Selecting a disposal method. In Location of solid waste disposal facilities in urban communities. M.S. Thesis, Georgia Institute of Technology, Atlanta, Aug. 1967. p.21-25.

The basic considerations in selecting a method for disposal of solid wastes are: the absence of danger to public health, minimum nuisance to the public, and minimum cost. Before a community selects a disposal method, several studies should be made to determine which method best meets these criteria: a disposal practices survey, soil survey, air pollution survey, sewage disposal capacity survey, and a comparative costs survey. Evaluation of capital costs can be done by obtaining estimates for construction, and appraisals of potential sites. Operating cost estimates can be based on the expenses at existing facilities, but it is necessary to compensate for variations caused by differences in the level of maintenance, size of facility, percent of capacity being utilized, and other factors. The market for steam, compost, metal, and other byproducts must also be determined since their sale can partially offset operating costs.

67-0279

Harden, D. T. Planning for disposal facilities; Considerations in locating disposal facilities; Planning studies. In Location of solid waste disposal facilities in urban communities. M.S. Thesis, Georgia Institute of Technology, Atlanta, Aug. 1967. p.24-47.

The major considerations in locating solid waste disposal facilities are protection of surrounding land uses and minimization of collection and disposal costs. The three economic factors which must be considered are collection costs, initial site costs, and achieving maximum possible savings through co-ordination of disposal facilities with other utilities. Because of the extreme variability in local conditions within any area, any site being considered for sanitary landfill should be individually evaluated with respect to geological conditions and possible undesirable effects from filling. Possible uses of the site after filling is completed should likewise be considered. Coordination of landfill operations with park and recreation planning may enable a municipality to obtain new park sites much sooner than might otherwise be possible. Suitable sites should be identified and reserved for disposal uses as part of a municipality's general development plan. The following studies can help determine appropriate locations for such facilities: solid waste disposal facilities study, estimation of refuse volumes, determination of disposal facility demand, site survey, land use study, geological survey, transportation study, and economic analysis.

67-0280

Harden, D. T. Recommendations. In Location of solid waste disposal facilities in urban communities. M.S. Thesis, Georgia Institute of Technology, Atlanta, Aug. 1967. p.48-50.

In order to win public acceptance of the disposal facilities needed in metropolitan areas, the difference between what is known about proper refuse disposal and what is generally practiced must be reduced. Design and operating standards must be adhered to or any method will be a prolific nuisance source and unacceptable in an urban environment. The problem of lack of sites for landfill is best solved by shipping the refuse across county and municipal boundaries to other parts of the area for disposal. Even when suitable sites are available, some political jurisdictions are too small to have sufficient resources for the job. While refuse collection can be adequately handled by individual cities, disposal of the collected refuse must be considered as a regional problem. State legal authority should be obtained for establishing and financing refuse disposal services on an area-wide basis. Then disposal sites can be located to serve disposal districts embodying communities with common waste problems. The best general solution is probably the system used in Los Angeles where all refuse disposal is handled by the County.

67-0281

Hartman, C. D. Use of deep well method for waste disposal at midwest. Blast Furnace and Steel Plant, 55(10):911-916, Oct. 1967.

The use of deep well injection was practiced by the Midwest Steel Company to relieve their problem of industrial acid waste sludge accumulation. The cost of complying with the effluent water quality requirements involved the cost of sludge disposal more than the cost of water treatment. An aerial picture shows the lagoons which have removed 300,000 cu yd of wastes in five years. Two geologic cross sections are given which show the St. Simon formation of sandstone located 1,000 ft beneath the plat. This permeable water-filled formation is 2,500 ft thick and has an ample shale cover to prevent vertical migration. A sketch is given of the disposal well, as well as a schematic drawing of the filters and pumping facilities. Pictures are shown of the above-ground portion of the well, the inside of the filter building, the control panel, the filters and pumps, and the pump building. A table shows the analysis of the connate water at 3,500 ft which prompted the pumping of 35 million gal of fresh water into the well before the waste was pumped in. The fresh water was used to prevent plugging with gypsum from the reaction of the waste acid and the 10,700 ppm of calcium in the connate water. A table, listing nine cost components, shows that the waste acid disposal cost by deep well is $5,182 per month compared to $32,972 by neutralization. The underground disposal concept has relieved the acid waste sludge accumulation at a substantial saving.

67-0282

Harvey, K. Refuse disposal in the city of Birmingham. Public Cleansing, 57(12): 622-644, Dec. 1967.

A description of the history and organization of the City of Birmingham's Salvage Department is given. The output, character, and composition of the refuse from 1930 to the present time is presented and the results of the refuse analysis, the heat value, and the moisture content of refuse components are tabulated. Special facilities have been provided at Lifford and Castle Bromwich Works for the handling of the bulk combustible and trade refuse, and the volumetric reduction of refuse at the Lifford Works is tabulated. The design of Castle Bromwich Refuse Disposal Works is described in detail, with particular emphasis on the operation of the electrostatic precipitators which give a gas cleaning efficiency of 96.18 percent. The operation of a Heenan-Nichols continuous-grate incinerator pilot which requires no pre-screening of fines, etc., and has a fully automated refuse burning grate is described in detail. A pressure filter sludge de-watering plant was added to the Montague Street Works in 1965. It is designed to treat 100,000 gal of thin sludge per 40 hr week with the potential capability to double this capacity.

67-0283

H.E.W. sponsors national conference on air pollution. APWA Reporter, 34(2):8-9, Feb. 1967.

In order to maintain clean air, a new system of waste disposal must be found. The Solid Waste Disposal Act makes it possible to relate solutions for land pollution problems to those of air and water. However, a four-point amendment process should be undertaken: Federal financial support to municipal agencies for the construction of solid waste facilities; financial support for the development and maintenance of management programs; a system of controls to ensure that industry will not produce excess waste; funds, in the amount of $200 million a year, for construction grants. One solution for the disposal of solid waste, incineration. contributes to the problem of air pollution. Therefore, other alternatives must be considered and these must be based on the cost, resource reuse, and the fact that only land and ocean can be sinks into which solid waste can be discharged. Air pollution can also be eliminated through better designed and operated municipal incinerators, control of incinerator emissions and flue gas washers. It is also necessary to: abolish open burning; enforce incinerator air pollution regulations; research for simplified continuous particulate measurements; upgrade management level employed in all aspects of solid wastes; and continue research and development for new and improved refuse disposal techniques.

67-0284

Higginson, A. E. Refuse disposal—future developments. Journal of the Institution of Public Health Engineers, 66(4):253-287, Oct. 1967.

In a paper presented at the April (1967) meeting of the Institution of Public Health Engineers at Eastbourne, the unsatisfactory status of present refuse disposal practices, and future developments, are discussed. Present trends, particularly in refuse output, change in composition, densities, and population movements or expansions, are noted. Current acceptable methods of refuse disposal are outlined prior to a detailed discussion of future aspects and developments which include: controlled dumping; pre-treatment of refuse; transportation to final dumping sites; composting; refuse incineration; and gas cleaning. The Von Roll, Heenan Nichols, and Martin Stoker incinerators are described, with diagrams. Future emphasis will not be on composting but on refuse incineration, which offers the greatest reduction in volume and weight of refuse. Some future applications of waste heat recovery are discussed, including desalination and sewage sludge disposal. A variety of disposal requirements are considered, including those for cars, bulky wastes, wastepaper recovery, ferrous metal recovery, and industrial wastes. Future aids to disposal, such as reduction of bulk at source, on site incineration, and sealed vacuum disposal of refuse, are described. An abridged discussion of the paper by conference participants is included.

67-0285

Hoesch, K. From donkey-drawn wheelbarrows to sanitary landfills. Staedtehygiene, 18(10):228-231, Oct. 1967.

The history of waste disposal from the Middle Ages to modern times is reviewed. In 1506 Paris blazed the trail by introducing a periodic street cleaning service. The first incinerator plant was built in Hamburg in 1896. But only after World War I did closed garbage cans and containers come into being. Incineration is costly and besides, only about 50 percent of the volume is reduced while the other 50 percent still has to be dumped somewhere. The sanitary landfill came to be the solution to the problem. The costs are very reasonable. They lie within 2.50 DM to 4.00 DM per ton of waste as against 25 DM to 70 DM per ton with incineration. Two types of waste collecting trucks are in use right now. In the first type the waste is just compacted, whereas with the second type it is constantly mixed in a rotating drum and compacted. (Text-German)

67-0286

Hoffman, D. A. 'Burns' refuse without a flame. American City, 82(2):102-104, Feb. 1967.

San Diego, California, (pop. 670,00) has made several steps in the area of solid waste disposal. They are experimenting with pyrolysis and volume reduction, and are researching the possible commercial value of the liquids and gases emitted from these processes. Before testing pyrolysis, the City studied other methods of solid waste disposal. They found that the high cost and air pollution factors prohibited archaic incineration methods. Dumping refuse at sea produced a definite water pollution problem. Disposal of solid wastes through pyrolysis shows promise: (1) The reduction in refuse volume would extend the lifespan of existing landfill sites. (2) The process could readily be converted into a continuous (self-sustaining) operation. (3) The by-products of the pyrolysis method have a probable commercial value. The gas by-products known to be emitted from the pyrolysis of mixed refuse are: carbon dioxide, carbon monoxide, methane, ethane, ethylene, and hydrogen. Some of the condensable products from pyrolysis are pyroligneous acids and tars, an aqueous mixture, and a pyrolytic char which resembles anthracite coal. The particular products which are obtained, however, are dependent upon the pyrolytic temperatures. San Diego's steps toward greater efficiency in solid waste disposal were approved by the U. S. Public Health Service on June 1, 1965, even before Congress passed the current solid waste bill.

67-0287

Hughes, G. M. Selection of refuse sites in northeastern Illinois. Environmental Geology Notes No. 17. Urbana, Illinois State Geological Survey, Sept. 1967. 26 p.

Fourteen million cu yd of refuse were collected in northeastern Illinois in 1960 and the figure is expected to rise to 18 million cu yd per year by 1980. Geologic environments were evaluated in terms of results of studies on refuse disposal and groundwater contamination in dumping sites. The geologic environments commonly considered as safe for refuse disposal in northeastern Illinois are those with materials of low permeability and those that are relatively dry. Many areas in this part of Illinois are underlain by thick glacial tills with low permeability which may be favorable for disposal purposes. Rainfall alone is probably adequate to saturate a landfill and produce leachates. There are probably few areas where refuse can be disposed of in excavations above the zone of saturation. A list of reports in the Environmental Geology Notes series and references are appended.

67-0288

Idaho Department of Health. Solid waste explosion. Idaho Health Bulletin, 1-24, 1967.

Based on national figures, the amount of refuse disposed of per person in Idaho is about 4.5 lb per day. The solid waste problem is reviewed in relation to garbage, rubbish, ashes, special wastes, industrial and agricultural wastes, and abandoned automobiles. In Idaho, open dumps flourish and burn, contributing to air pollution and serving as breeding and feeding places for rats and insects. Some sanitary landfills in the State have been allowed to deteriorate and in some instances pollute the ground water. Open dumping presents Idaho's greatest waste disposal problem because there are more open dumps in use than landfills. The most widely used excuse that many communities give is that landfill is too expensive. However, the eradication of the health hazards presented by the dumps must take precedence over saving money. Four simple steps to a good sanitary landfill operation are illustrated. The advantages and disadvantages of sanitary landfill, incineration, and composting are outlined. In Idaho, the Solid Waste Program is carried on by the Vector Control Section of the Engineering and Sanitation Division, Idaho Department of Health and is made possible under the sponsorship of a Solid Waste Planning Grant from the U.S. Public Health Service. To date, 256 refuse disposal sites serving a population of 555,000 have been surveyed in Idaho. Less than 2 percent of the operations are considered sanitary. Idaho presently has few State laws to adequately deal with the rising volume of solid wastes. Enforcement of most of these laws is difficult because the majority of the violations are committed without witnesses and insufficient evidence remains to identify the violator.

67-0289

Information on refuse disposal. Surveyor and Municipal Engineer, 129(3917):16, 1967.

A request from the Ministry of Housing and Local Government to local authorities for information concerning quantities of refuse presently dealt with and disposal methods used, is reported. Evidence is requested for the suitability and effects of the various methods in use; evidence of any operational difficulties is requested. The Ministry also requested suggestions for improvements and views on the administration, control, and coordination of current refuse disposal systems.

67-0290

Institute of Public Cleansing Conference. Surveyor and Municipal Engineer, 129(3915): 69, June 17, 1967.

Points from the discussion at a recent Institute of Public Cleansing Conference are reviewed. A bill providing stiff penalties for dumping and provisions for adequate arrangement for legitimate disposal was of particular interest in reference to the problem of dumped rubbish and abandoned cars. Limiting excessive use of packaging and pulverization before tipping were other important points. A paper was presented on disposal of radioactive substances and the desirability of tip workers wearing measuring devices; the resulting discussion is recounted in detail. Questions were also raised concerning dust as a contributor to disease.

67-0291

International Work Group for Waste Research. Wasser und Abwasser, 108(34):972, Aug. 1967.

The International Work Group for Waste Research issued a booklet (No. 29, Apr. 1967) which contains the following articles: Experiments with the composting of crushed waste—W. Obrist; Thoughts on the design of waste incinerator plant—L. Reifert; The experimental composting plant in Johnson City, Tennessee, U.S.A.—J. S. Wiley, F. E. Gartrell, H. G. Smith; A method for monitoring the temperature in composting beds—F. Moller and K. Krannich. (Text-German)

67-0292

'Is it goodbye green earth?' Popular Gardening and Living Outdoors, 18(4):22-36, Fall-Winter 1967.

Americans have created a highly contradictory situation: they have never been more highly motivated about conservation but can also be characterized as the 'greatest junk collectors in the history of the world'. Faced with the problem of saving our earth, we have taken some rather strange steps; for example, in order to conceal junkyards, slums, etc., we widely distributed billboards and signs. Now it has become a question of which is the greater evil—the litter of the junkyards or the litter of the visual media. Attempts to put up an impressive, but false, image, neglect and indifference are named as three factors which have caused the problem to become as wide-spread as it is. Most citizens neither know nor care what happens to the 800 million lb of solid wastes that accumulate every day, or that the amount will increase to nearly 2.5 billion lb a day by the 1980's. It is estimated that the average American disposes of about 475 lb of paper a year, plus a half-ton of other debris. Growth of the waste disposal problem, moreover, is directly proportional to the population--if there are more people, there are more wastes. City administrators, having to face the dilemma of disposal of solid wastes, have turned to State and Federal governments and science for aid. However, this is a crisis which requires the direct support of individual citizens, beginning with reviewing our own practices which may be contributing to the fouling of the environment. Obtaining copies of local and State laws on water and air pollution, trash disposal, etc. will help; in other words, we must work to clean up our earth, not to deposit still more wastes on it.

67-0293

Jarosch, K. The sanitary condition in the City of Linz. Staedtehygiene, 18(2):25-28, Feb. 1967.

Among other municipal problems such as water supply and air pollution, the city's solid waste disposal methods of the past and present are briefly discussed. The municipal records of Linz, Austria, report that trash collection was started in the year 1902. Throughout the years all waste has been dumped into landfills; at the present, however, the possibilities for erecting waste incinerators in connection with power plants and remote heating plants are being studied. (Text-German)

67-0294

Kaiser, E. R. Refuse reduction processes. In L. Weaver, ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.93-104.

Advantages and disadvantages of various methods of refuse reduction are discussed. The methods are: open burning, burning in conical metal chambers, landfilling, composting with sale of compost, and incineration with and without heat recovery. Tables give refuse composition in weight percent; refuse analysis in weight percent and pound percent per refuse ton; and products of incineration by weight and volume. Average weights and volume reduction for the various methods is discussed. Volume reduction by incineration is impressive. The air pollution problem is discussed; filtration methods are briefly described; and a sample analysis of flue gases is given. European incinerators burn refuse with 1.6 times the stoichiometric air instead of 3 times as in the United States. Gases are cooled in the boiler, contracting the gas volume without spray water. The precipitators are 98 to 99 percent efficient. Research in destructive distillation and gasification of refuse is briefly outlined.

67-0295

Kearing, S. J. Solid waste disposal: where do we go from here? In Proceedings; MECAR Symposium, Incineration of Solid Wastes, New York, Mar. 21, 1967. Metropolitan Engineers Council on Air Resources. p.43-50.

The basic problems of refuse disposal in New York City are discussed. There seems to be no immediate alternative to incineration and/or landfill. Few landfill sites are available, and they are far away from the centers of refuse production, requiring long haul distances. An application was made recently to the U.S. Public Health Service for $1.3 million for a prototype installation of a powerful shredder to handle bulky demolition and construction wastes. Utilizing the energy in the scrap combustibles to produce the power required by the shear and shredder is being considered. Refuse collection and disposal studies are proposed under Title IX of the New York State Public Health Law which provides for 100 percent State financing for local studies. The application of Local Law 14 in New York City to reduce emissions from apartment house incinerators is pending. Prospects for the future include: more easily disposable containers; home garbage grinders in urban areas; nuisance-free apartment incinerators; utilization of refuse as a fuel to generate power; reclamation of swampy areas; pollution-free ocean disposal; pyrolysis of refuse; and compaction of apartment refuse.

67-0296

Kirov, N. Y. Disposal of municipal refuse. Australian Chemical Processing and Engineering, 20(5):16-21, May 1967.

Four methods of municipal refuse disposal are presented: dumping at sea, composting, controlled tipping, and incineration. Only the last two are considered effective, practical, and hygienic, and, therefore, are discussed further. Controlled tipping is the most economical when suitable and sufficient land is available within reasonable hauling range. Proper compaction and application of inert covering are necessary to exclude the access of air which might initiate spontaneous combustion. Incineration is the most practical and hygienic solution to the disposal problem. The aims of incineration are given as follows: to sterilize waste material and eliminate the health hazard; to reduce the volume of refuse; and to reduce hauling and disposal costs. Variation of refuse according to country, standard of living, and season of the year is discussed and presented in tables. The average composition of main components of municipal refuse (percentage by weight) and the typical moisture content and heating values of various refuse components are summarized in tables.

67-0297

Knoll, K. H. Today's state of the art of hygienically satisfactory elimination of solid and liquid municipal waste, with special consideration of rotting processes. Staedtehygiene, 18(2):28-32, Feb. 1967.

There are three satisfactory waste disposal methods: dumping of waste into landfills, the somewhat costlier aerobic waste decomposition, and the incineration of the waste, the most expensive method since costly equipment is required for filtering the flue gases. Part of the costs can be covered by selling the compost in the one case and the generated heat in the other case. Usually a combination of the two methods is required for entirely eliminating the waste. In two tables, costs and a hygienic evaluation of the three methods are presented. Of these, dumping poses the greatest hazards to the environment. For aerobic decomposition, various methods have been devised: rotting in open rotting chambers, rotating rotting drums (Dano), rotting towers (Multibacto), and capillary drying processes (Brikollare). All these methods are hygienically unobjectionable if the temperature of the rotting waste is maintained above 55 C for an extended period of time, ranging from a few days to three weeks, depending on the particular process. Processing time is about 3 weeks for rotting chambers, 6 to 7 days for rotating drums, and 1 day for the rotting towers. The capillary drying process, where bricks are pressed, takes about 3 weeks. For all processes, 40 to 60 percent water content is required. Ashes obtained from a supplementary incinerator can be safely mixed with the compost. All processes discussed are listed and their significant features evaluated. (Text-German)

67-0298

Little known about trash disposal. Construction Methods and Equipment, 49(8):10, Aug. 1967.

In an interview, Leo Weaver, chief of the Solid Waste Program in the Public Health Service, indicated that while a small amount of research money is available to study means of coping with trash and solid wastes, there is a need for much more information on the contaminants and especially on methods to reduce the vast amounts of wastes. The construction industry is involved in many of the solid waste problems, such as building incinerators for cities. In a project where the Caterpiller Tractor Co. is working with the Public Health Service, it is planned to pump Chicago's sewage, after primary treatment, by pipeline to Southern Illinois for use in reclaiming unused land. The Caterpiller Company would test some of its equipment while grading the landfill site. Such aspects of sanitary landfill areas as heat buildup, settling effects, and compaction-extruder equipment are also being studied.

67-0299

Maine conservationists aid solid waste disposal. Public Works, 98(6):141-142, June 1967.

Townships in northern Maine are using water science and modern land techniques in relocating old dumps and siting new ones on suitable soil. Previously refuse had been dumped into sand and gravel pits, and on stream banks. Water was contaminated. Newer installations are located on recommended loamy soil and on side roads where they do not offend the eye. Loam filters out the pollutants. Trenches to receive wastes are dug along contour levels established by SCS technicians. Trash materials are covered by soil. Shrubs and trees are planted. Diversion channels and water spreading devices are installed to keep dumps from eroding and flooding.

67-0300

A new look at refuse disposal. Surveyor and Municipal Engineer, 129(3920):19-20, July 22, 1967.

Wetherby Rural District in Yorkshire, a district of high landscape value, had a problem of limiting tipping to shallow layers without producing a nuisance. The sewage disposal plant also had problems in the treatment, drying, and disposal of the sludge. A 'Buhler System' plant was installed for the treatment of the sludge and refuse to produce compost by the windrow method. This system has been used in Switzerland for years, primarily to produce what has been considered the best compost produced from domestic refuse and sewage sludge. A scale drawing is given of the refuse-sewage treatment plant for Wetherby, which has a capacity to treat 66 tons per 7-hr day at an estimated cost of 29s per ton. The total population to be served is 40,000 but it has the capacity to serve 60,000 on an 8-hr day operation. The 40,000 includes 11,500 from the adjoining Rural District of Tadcaster whose refuse will be received on the basis of a charge per ton of refuse received. An experimental trade waste incinerator with a capacity for incinerating 1 ton reject material per hr without smoke can be used also for incinerating bulk refuse. The refuse is passed through two mills, under a magnetic separator, and over a vibrating screen to remove the material such as plastic, leather, nylon, and rags which will not pulverize. The reduced refuse is mixed with a controlled amount of sludge for discharge to the storage bays. After 5 weeks storage, remilling, and stacking for another 5 weeks, a fine stable landfill material is produced in an operation which only requires two employees and a plant which costs £132,889.

67-0301

Middleton, J. T. Air pollution and solid waste disposal practices. In L. Weaver, ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.35-39.

Air pollution due to refuse disposal in Washington D.C. is a regional problem. Eighty percent of all refuse in the Washington area is burned producing such pollutants as carbon monoxide, hydrocarbons and particulate matter. Burning accounts for 22 percent of all particulate pollutants. About two-thirds of the total particulate matter produced comes from the District of Columbia. Burning must be reduced. Solutions presented are: the use of sanitary landfill operations and eliminating individual incinerators for each building.

67-0302

Municipal resistance against disposal units. Rohr-Armatur-Sanitaer-Heizung, 22(9):726, Sept. 1967.

Unlike the United States, the garbage disposal unit is not yet widely used in the German kitchen. While 12 million American households are equipped with it, only an estimated 20,000 German households have it. Many German municipalities sternly oppose a spread of the disposal unit because they fear that the sewage system cannot take it. They argue that the sewage system would have to swallow an additional 50 percent of soluble substances and 61 percent of solid substance per household. American municipalities, on the contrary, argue that the disposal unit relieves the trash can from rotting waste and also considerably reduces the weekly amount of trash so that one collection per week suffices. Fewer personnel are needed and thus the disposal unit is regarded as a great help. Six companies offer garbage disposal units; two of them, General Electric and Kenwood, are foreign enterprises. Observers estimate the potential market to be about 1.5 percent of all German households. (Text-German)

67-0303

New refuse treatment plant for Aberdeen. Public Cleansing, 57(10):555-557, Oct. 1967.

The City of Aberdeen, England, has negotiated an agreement for the installation of a plant capable of handling 300 tons of refuse in an 8-hr day. The 2-acre site on which the plant will be erected is adjacent to the dumping ground and provides adequate accommodation for future expansion. An illustration of the plant is provided.

After passing through the reception area and hoppers, the refuse is discharged into two silos. Each silo is 82 ft long and is fitted with an extendable perforated screen delivering pulverized material onto a cross belt. From there it goes to a common conveyor belt discharging over a shuttle conveyor into five 50-cu-yd hoppers, each fitted with a hydraulic discharge door. Oversize material and rejects are conveyed separately to a rejects hopper. These hoppers permit vehicles to drive under and receive a load of material for final deposit on the refuse dump. The capacity of the silos ensures that refuse is treated for a period of eight hours before discharge, during which time the organic content of the refuse is thoroughly granulated. It is estimated that the density of the end product will be 8 cwt per cu yd as compared with 2.6 cwt per cu yd of crude refuse. A Dowson and Mason incinerator, having a rated capacity of 2 tons per hr, will form an integral part of the plant and is designed to deal with all categories of trade and bulk refuse. Adequate safety, dust, and air pollution control equipment is provided for the plant.

67-0304

Oakley, H. R. The disposal of communal waste. Jounal of the Royal Society of Arts, 115(5131):533-546, June 1967.

This is a paper presented to the Royal Society of Arts discussing these aspects of communal waste disposal: background development of the problem, use of natural water courses for disposal, water reuse and advanced treatment, subsoil disposal, marine disposal, sludge disposal, refuse composting, and industrial waste. The waste disposal problem is not a new one; a brief history of similar situations in earlier civilizations is given. Suggestions are made concerning creation of bacterial standards for discharges into streams. Cost is mentioned in proportion to the treatment necessary to insure safe and efficient disposal. Agriculture and recharging of ground water supplies are given as suggestions for reuse of treated water. Sewage and sludge disposal problems are compared with problems of solid refuse disposal, in reference to biological aspects as well as economic problems.

67-0305

Private contracting group sets solid waste disposal plans. Environmental Science and Technology, 1(11):873, Nov. 1967.

Plans for a new pollution-free disposal plant in Houston, Texas, are reported. The proposed $5-million plant should be able to handle one quarter of a billion lb of solid waste per year. Foster Wheeler, which has already built a similar system for the U.S. Navy at Norfolk, Virginia, says that the system, by blending and controlling the feed, can dispose of such quantities of solid waste without nuisance or ill effect. The plant will generate each month 80 to 100 tons of ash residue that are chemically neutral and satisfactory as a low grade land fill. The plant will be built on a 20-acre site with ample room for storage of wastes, the key to the operation, because disposal can then be adjusted to meet meteorological conditions. The plant will generate, for sale, 100,000 lb of low pressure steam per hr as a by-product of the disposal.

67-0306

Refuse disposal. Engineer, 224(5815):21, July 7, 1967.

The Working Party on Refuse Disposal, appointed by the Minister of Housing and Local Government in May 1966 to study methods of refuse disposal, has requested formal written evidence from interested organizations, firms, or individuals on refuse disposal data. The Working Party is supposed to consider the available methods of refuse disposal and to evaluate these methods in regard to the changing character of refuse and the increasing quantitites. Advice is to be furnished to local authorities on the methods best suited to local conditions and on the practical aspects of refuse disposal. Local authorities are being asked to supply information about quantities of refuse being dealt with, the methods used, the suitability and effects of these methods, operational difficulties, and desirable changes. The wastes of interest are house refuse, trade wastes, and commercial wastes. Views on the administration, control, and coordination of waste disposal in general will be welcomed by the Secretary of the Working Party: E. R. Green, Ministry of Housing and Local Government, Whitehall, S. W. 1., London.

67-0307

Refuse disposal: Working Party seeks evidence. Public Cleansing, 57(8):396, Aug. 1967.

The Working Party on Refuse Disposal, which was appointed by the Minister of Housing and Local Government in May 1967 to study methods of refuse disposal, is now inviting formal written evidence from interested organizations, firms, or individuals. The Working Party is investigating the following parameters: the various methods available for the disposal of refuse and the question of how satisfactorily they are being operated; evaluation of these methods, with particular regard to the increasing quantities and changing character of refuse; and type of advice to be given to local authorities and others concerned, on the choice of methods and on other practical aspects of refuse disposal. While the principal wastes which the working party will be considering are household, trade, and commercial refuse, the investigations may also cover industrial refuse. Disposal of radioactive wastes, toxic wastes, or chemical wastes will not be considered.

67-0308

Reynolds, W. F. Abandoned strip mines studied for solid waste disposal. Public Works, 98(5):74-75, May 1967.

Strip mine areas and gob piles commonly create air and water pollution problems. Collecting refuse and disposing of the wastes in old mine sites could help solve this problem plus the problem of finding disposal sites. A demonstration project is under way in Allegheny County, near Frostburg. The cost will be $191,320 of which $126,318 is a grant from the Public Health Service. It is a three-phase project to be completed by 1970. The Frostburg site has a 21-acre area and 30 ft depth. The rate of pit filling will be calculated and weights and volumes of solid wastes measured. Cost records are being maintained. During the second year an engineer will be checking landfill volumes and measuring changes in surface and ground water at a second site, probably near Westernport. In the third year, an engineer will inventory all abandoned mine sites in the State; rate their suitability for landfills, and determine space available. Maryland officials are interested in combining solid waste and sewage sludge for disposal. Buried wastes may yield carbon dioxide and methane, a dangerously inflammable and explosive gas. Officials believe they can detect and control or eliminate this development.

67-0309

Rubbish will reclaim mined areas. Engineering News Record, 179(13):19, Sept. 28, 1967.

The rubbish which now costs the City of Philadelphia $7.50 a ton to incinerate can be disposed of by shipping it to Schuylkill County by rail for dumping in abandoned coal mines for $5.39 a ton. The Eastern Land Reclamation Co., a subsidiary of the Reading Railroad, expects to sign a contract for a 4-year experimental project to haul 1/4 of Philadelphia's 5,000 tons per day of rubbish 90 miles to the abandoned strip coal mines. Two transfer stations in the south and southwest sections of Philadelphia adjacent to the Reading tracks will shred and compact the refuse before shipment. Since pig farmers collect domestic garbage in the Philadelphia area for feed, the garbage will not be included in the mine fill. The use of the abandoned strip mines will not only relieve part of the Philadelphia waste disposal problem, but will reclaim mined out land in Schuylkill County where the old mines average 2,000 ft long, 300 ft wide, and 200 ft deep. The program which needs the approval of the Philadelphia City Council will become effective nine months after the contract is signed.

67-0310

Shiny trash racks break record. Engineering News Record, 179(3):28, 33, July 20, 1967.

Designers in California's Department of Water Resources have used stainless steel to construct trash racks for the Oroville Dam. Measuring a record-breaking 600 ft long, 47 ft wide, the racks serve to keep rocks, logs, and junked automobiles out of the turbine. The difference in maintenance and installation made stainless cheaper than conventional carbon steel. The trash rack consists of 824 nearly identical flat panels supported on 180 segmented arches. The box-shaped web core of the arch provides high strength where high stress occurs. Oroville's trash racks are big because the twin-channel intake structure they cover is unusually long. The reinforced concrete intake is big so it can draw off warm water from the top, or cold water from the bottom of the reservoir. With 13 temperature control shutters on each channel, the intake will be adjusted so water can flow from the reservoir at or above any pre-selected elevation. Illustrations and detailed dimensions of the twin racks are included.

67-0311

Simon handling engineers to build Dundee plant. Public Cleansing, 57(12):665-666, Dec. 1967.

A £300,000 refuse disposal plant at Marchbanks, Dundee, scheduled for completion in early 1969, is described. The plant, with a capacity to process 100 tons of refuse every 8 hr and 20 tons per hr at peak periods, is claimed to be one of the most advanced of its kind in the world. Operations will include salvage by hand of clean paper and non-ferrous metal, as well as magnetic separation of tins for automatic feeding to a metal baling machine. The remaining refuse will be pulverized in a large machine having high-speed rotating swing hammers, which will reduce it to one third of its original volume. The pulverized refuse will then be compacted by four Simon-Compactors Wastepaktor units to give a final bulk density of about 1/2 ton per cu yd. Industrial and trade waste will be burned in an incinerator fitted with a Simon-Marbo automatic rotary type stoker. Dust-laden air from the reception hopper and transfer chutes will be washed before passing to the atmosphere. The resulting sludge will be treated at a main disposal point, together with ash from the incinerator and flue gas dust. A central vacuum cleaning system will be provided; to eliminate flying insects a number of Simon 'Insect-O-Cutor' units will be installed throughout the plant.

67-0312

Soil considered in relocating dumps. Refuse Removal Journal, 10(4):10, Apr. 1967.

Sixty towns in Maine are relocating their dumps to sites with soil which filters out most pollutants. A terraced effect will be created by covering waste-filled trenches with soil and planting trees, shrubs or grass.

67-0313

Solid waste disposal. Environmental Science and Technology, 1(1):11, Jan. 1967.

Abandoned strip mines in Maryland are to be used for disposal of all types of solid waste except sewage. This plan is to help alleviate the State's trash problems, although two side benefits may be the reclamation of scarred landscape and elimination of acid mine drainage which is polluting surface water. Cost, procedure, and precautions are being determined now in a demonstration project.

67-0314

Stephenson, J. W. Disposal of community wastes. Public Health Inspector, 76(2):98-108, Nov. 1967.

More than 14 million tons of refuse are collected annually. The kitchen garbage grinder adds 0.13 lb of dry solids per capita daily to the sewage system. Tipping operations must have adequate cover to exclude air and encourage heating and bacterial action within the pit. Earth moving machinery is essential. Salvageable items are removed at an incineration plant. Continuous grates permit refuse to be fed mechanically into the furnace, burned, and clinker discharged without a break in operation. In the pulverization process, refuse is fed into hammermills or rotary grinders where refuse is reduced from a 3-in. diameter to dust. Water is sprayed on contents in the 'Seerdrum'. 'Lanway' disintegrates refuse to a fine pulp. Two principal methods provide accelerated compost: fermentation in vertically arranged cells where refuse is combined with sludge; refuse is fed into a revolving incinerator and injected in regulated quantities. Sewage may be treated in septic or settling tanks. Sewage should pass through screens or a comminuting device to remove extraneous material. It passes to sedimentation tanks and then is filtered. Excess film and dead organisms are removed in humus tanks. Sludge may be dried mechanically and incinerated. Foam from detergents affects watercourses, weirs, and locks.

Some river authorities demand effluent standards better than the 30 mg per liter suspended solids and 20 mg per liter BOD recommended by the Royal Commission. Data on refuse and sewage characteristics and disposal are given.

67-0315

Still, H. The dirty animal. New York, Hawthorn Books, Inc., 1967. 298 p.

Starting with the premise that man is the dirtiest animal that ever lived, the growth of littered metropolitan areas is traced. Instances of air and water pollution are graphically described and a few cases in which pollution problems have been solved are noted. The problems of automobile exhaust fumes, accumulation of solid wastes, and transportation, as well as the hazards caused by pesticides and nuclear radiation are covered in detail. A brief examination of the technical and administrative methods available for the solution of some of these problems concludes the book. A selected bibliography and comprehensive index are included.

67-0316

Stinson, D. L. Underground disposal of slurried wastes. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. B-12.

The feasibility of operating a sanitary landfill system without disturbing the ground surface or interfering with the use of such ground is being investigated. The project is concentrating on finely ground materials and a series of shallow tests to determine under what conditions slurried materials will return to the surface. The first test involved a shallow well (23 ft), drilled and cemented into a soft impermeable shale formation. Several 10,000 gal. batches of soil in water have been injected into the 2-1/2 in. casing used for the well. Pressures necessary to part or fracture the formation have been many times what was expected.

67-0317

Taggart, R. S. Dry waste disposal. Food Engineering, 39(7):98, July 1967.

The developments and refinements in the effective disposal of dry waste are reviewed. Air pollution control activities are placing the emphasis on well-designed and properly operated incinerators and the elimination of incinerators lacking controls and scrubbers. Large metal boxes such as 'Dempster Dumpster', 'Pax-All', and 'Trashtainers' in various locations of a plant allow the removal of large quantities of solid waste to transfer points with the minimum of labor. Compaction of refuse increases the efficiency of hauling. Shredding and pulping into a semi-solid mass is one form of compaction desirable where security is a factor. Compacted refuse which is covered daily at the landfill is replacing open dump burning. Presses and baling machines for waste paper for salvage continue to be of value. Polyethylene liners for refuse containers or paper bags have found wider use and reduce spillage and are safer for handling infectious or hazardous wastes. As labor costs increase, newer types of conveyors such as pneumatic tubes can be justified for waste handling. With better mechanical handling, more accurate controls, seeding, and the use of enzymes, more efficient use will be made of anaerobic digestion of solids as sludge. More wastes are being reprocessed and salvaged to become raw materials. The disposal of solids by dry means is being stimulated by new and stringent Pure Water Laws under which complete interception and disposal of wastes in a dry form becomes a necessity.

67-0318

Tomczak, G. The sea—a trash can for the refuse of industry and cities? Gas-und Wasserfach, 108(20):578-580, May 1967.

This paper deals with the necessity for international conventions to prevent pollution of the sea and the present status of such measures. Since the wastes of highly industrialized nations are more frequently being dumped into nearby coastal areas, both the maritime life as will as sea water conversion into fresh water is threatened. It was recognized relatively early that petroleum products are particularly hazardous. On May 18, 1967, a pact agreed upon by the Intergovernmental Maritime Consultative Organization will become effective, barring all dumping of oil or oily residues into the sea. Arguments regarding radioactive waste are heard by the International Atomic Energy Agency in Vienna and by the European Nuclear Energy Agency in Paris. The concentration of radioactive elements in certain organisms is not yet fully understood. Dumping of industrial waste into the sea is investigated by the Economic Council of the UNO. Questionnaires sent to all nations will form a basis for future international agreements. In Germany, the biological institute of Helgoland will hold a symposium on sea pollution from Sept. 19 to Sept. 21, 1967. (Text-German)

67-0319
Tovey, N. E. Recent developments in sea wall construction and land reclamation. Royal Society of Health Journal, 87(1):31-35, Jan.-Feb. 1967.

The County Borough of Southport has used controlled dumping as an economical means of refuse disposal and as a means of reclaiming large areas of land. The town is located on an area of windblown sand, with most of the land between 20 to 40 ft above sea level. However, a considerable area is below 20 ft, which is under water during the ordinary spring tides; this area requires extensive sea defenses. For example, the main bulk of the filling for a mile-long section of a new sea wall is household refuse. This project reclaimed an additional 90 acres of land along the shore, part of which has been incorporated into a new marine lake. The wall itself will form a link in a new coastal road which helps relieve traffic congestion on the shore in the summer. The seaward side of the wall is revetted with old paving blocks and the front is constructed with stabilized sand. The mile long wall cost £80,000, less than half the cost of traditional construction. Pictures show the marine lake with a dredger with a floating delivery pipe, concrete precast wall units for the perimeter of the lake, and sea wall sluices. Over 50 years, large areas of formerly watery tracts have been reclaimed for recreational uses and 200 acres of waterlogged moss land have been filled and turned over to agriculture. Because of low-density housing, long hauls are required to collect the refuse, and barrows are used to bring bins to the collection vehicle. Larger reclamation plans are indicated on the seaward side of the town.

67-0320
Treating wastes with Gamma irradiation. Public Works, 98(9):160, Sept. 1967.

The Metropolitan Sanitary District of Greater Chicago has entered into an agreement with the Purdue Research Foundation at Purdue University, in an experimental program for treating waste materials with irradiation from an atomic energy resource. The program will involve the treatment of waste primarily to disinfect and condition raw and digested sewage sludge.

67-0321
Vater, W. Meeting of the Association of Water Pollution Control work group for Baden-Wuerttemberg. Wasser und Abwasser, 108(14):384-385, Apr. 1967.

The 12th meeting of the Association of Water Pollution Control work group for Baden-Wuerttemberg was held on August 13 and 14, 1966, in Villigen, Germany. A number of papers dealt with water pollution problems and one treated the combined incineration of sludge and waste. A special kind of furnace has been constructed for this purpose in Villigen. Fifteen municipalities share in the operation of the furnace. Annexed to the incinerator is a composting plant for combined composting of waste and sludge. (Text-German)

67-0322
Wants Chicago to build trash mount. Refuse Removal Journal, 10(12):44, Dec. 1967.

Chicago's Sanitary District general superintendent has urged the Windy City to make mountains out of refuse molehills and to use them for skiing. Cook County Forest Preserve land is being touted as a site for the proposed mountain. The Calumet-Sag Channel runs through this land, located in the suburbs southwest of Chicago. The superintendent made a survey there and came up with the idea. According to him, solid wastes could be brought to the area by barge.

67-0323
Washington, D. C. examines its own rubbish problems. Refuse Removal Journal, 10(6):42, June 1967.

It is hoped that a summer conference in Washington, D. C., will plan a program to end air pollution from the Kenilworth Dump. Meeting plans call for disposal, air pollution control, health protection, zoning, land use, and urban planning.

67-0324

Waste disposal in municipalities. Wasser und Abwasser, 108(10):276, Mar. 10, 1967.

The center for waste disposal at the Federal Health Department in Berlin has made a list of all incineration and composting plants in operation and under construction. As of Jan. 1, 1966, 14 plants which burn the waste of more than five million people, were in operation in Germany . Eleven plants are now under construction. Eventually they will burn the waste of some 3.5 million additional inhabitants. Composting plants for processing the wastes of almost 500,000 people are in operation and a facility for some 240,000 additional persons is under construction. (Text-German)

67-0325

Waste treatment at Washington, D. C. airport. Public Works, 98(1):120, 122, Jan. 1967.

The waste treatment facilities at Washington National Airport are described. Raw waste is pumped to the plant where a bar rack is provided to screen out rags, paper towels, and similar trash. The oil separator, serving essentially as a primary clarifier for the removal of fuel oil and heavy sludges, is the first treatment unit. A continuously-operated longitudinal collector skims free oil to a slotted draw-off pipe, while sludge is scraped by the same collector flights on the return trip to hoppers at the influent end. Effluent from the oil separator flows to the detention basin, providing a detention time of 25 hr. The chemical treatment units consist of flash mix, flocculation, and dissolved air flotation basins. At the present time, alum alone is being used as a coagulant. Following sedimentation, the chemically-treated waste passes into the dissolved-air flotation compartment where air is introduced under pressure at the top of the tank. The recycle stream containing the dissolved air flows through a control valve which reduces the pressure to atmospheric and causes turbulence, thereby creating small air bubbles. Adsorption of the air bubbles onto the floc causes it to rise to the surface. The resulting float blanket is continuously skimmed into a scum trough. Effluent from the flotation unit enters a storage lagoon which provides additional equalization before the treated waste is pumped to the Arlington County plant. Total cost of the project was $846,300. This article is a summary from 'Design of Industrial Waste Treatment Facilities at Washington National Airport' by T. R. Hampton, Water & Sewage Works, October, 1966.

67-0326

The world's most disposable society. Public Health Service World, 2(8):25, Sept. 1967.

On July 19-20, 1967, in Washington, D.C., the first Conference on Solid Waste Management for the Washington Metropolitan Area was called by the Surgeon General at the suggestion of Senator Joseph D. Tydings. The objective of the conference was to develop an approach that could be a model for other metropolitan areas with similar problems. If a way were found to abolish open dump burning, the local air pollution problem would be alleviated. Leo Weaver, former chief of PHS's Solid Wastes Program, stated: 'Our first goal must be an end to the fire at Kenilworth (the city dump) no more than 1 month from today,' and he proposed a sanitary land reclamation operation. Weaver also called for the creation of a permanent commission responsible for coordinating the solid waste disposal programs of the region.

67-0327

Yonkers, New York site beautified following plan of Hudson Valley Commission. Refuse Removal Journal, 10(12):42, Dec. 1967.

Following the advice of the Hudson River Valley Commission, the community of Yonkers has decided to construct a 1,000-ft retaining wall to prevent trash in a disposal site from sliding down the hill to the railroad tracks and to landscape the wall, as well as to control odors and smoke from the refuse deposited there.

The community plans to build a city park on the site. The community council has also called for a study of a new blast-furnace type of incineration in an effort to find suitable methods of refuse disposal, particularly in view of the fact that the Croton Point landfill used at present will be closed in 1968.

AGRICULTURAL WASTES

67-0328

Blanken, G. The technology of chicken feces utilization. Landtechnik, 22(21):663-668, Nov. 1967.

The processing of chicken feces into marketable fertilizer is discussed. Drying of the feces is carried out in a rotating drum equipped with a biological filter for deodorization of the vapors. Less expensive methods of deodorization are being tested. Manure preparation is carried out by mixing the feces with peat or a foamed material which is then fermented in thermostated premises. This process is highly automated and feasible only on farms with 20,000 chickens or more. Automatic equipment for cleaning chicken coops is described. It is emphasized that according to present market conditions the use of the product in adjacent fields is most economical. Manure preparation may be somewhat more economical than drying. However, marketability must be ensured because the additives are expensive. (Text-German)

67-0329

Dale, A. C., and D. L. Day. Some aerobic decomposition properties of dairy-cattle manure. Transactions of the American Society of Agricultural Engineers, 10(4):546-548, 1967.

The Pasveer oxidation ditch is being investigated as a new method for treatment and storage of livestock manures. In order to design a ditch for dairy production units, experiments were undertaken to discover: the percent of volatile solids that can be broken into water and carbon dioxide; the percent of solids remaining in the ditch; and BOD of the effluent. Daily manure production (as tables demonstrate) for a 1,500 lb cow was 107.8 lb; the average dry matter in the feces and urine was 12.5 percent. Cattle rations consisted of 75 percent corn, 15 percent soybean, 8 percent oats, and smaller amounts of vitamin A and D supplement, salt, and dicalcium phosphate. In the experiment, collected feces and urine were mixed and then strained to remove all solids. Waste manure was added daily to aeration chambers. Weekly samples were taken. Included tables reveal subsequent BOD reduction under specific circumstances and decomposition of volatile solids. The following conclusions were made: (1) The greater the concentration of dairy cattle wastes added to an aerobic digestion chamber, the lower the breakdown of volatile solids. (2) Approximately 50 percent of volatile solids will decompose in a retention time of 18.5 weeks when daily added wastes equal 1/2 percent volume or 46 percent at 1 percent volume. (3) The effluent, as indicated by 5-day BOD, was reduced by 90 percent. (4) Salts became concentrated, but not enough to retard bacterial action.

67-0330

Darley, E. F., C. S. Davis, D. E. Munnecke, et al. Non-combustive disposal of solid agricultural wastes. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. E-16.

Historically, the solid wastes generated in the cultural operation of orchards, vineyards, and certain field crops in California have been disposed of by open burning. With increased urbanization of areas in and around such agricultural operations, the demand for cleaner air has necessitated rules and regulations limiting the amount of burning. In the present project, consideration will be given to shredding plant wastes and letting them fall to the ground to be incorporated into soil. The feasibility of shredding will be determined with respect to climate, differences in plant species, rate of decay of shredded material, effect on plant disease organisms and other soil microflora, and effect on insect pests.

67-0331

Day, D. L. Current status of the oxidation ditch, summary of United States and European research. Presented at Tenth National Pork Industry Conference, Lincoln, Neb., Nov. 9, 1967. 8 p.

The oxidation ditch, developed at the Research Institute for Public Health Engineering, TNO, in the Netherlands, is a low-cost method for purifying non-pretreated sewage emanating from small communities. The system is a modified form of the activated-sludge process and may be classified in the extended aeration group of odorless aerobic treatments. The design criteria for municipal oxidation ditch plants and a schematic diagram of the system are presented. The oxidation ditch idea can be adapted beneath slotted floors in confinement swine buildings. Although the BOD of liquid hog manure is usually 30,000 to 50,000 ppm, hog waste can be aerobically stabilized without objectionable odors and a final effluent can be produced which will meet public health requirements of a BOD of 20 ppm or less. Severe foaming, poor sludge settling characteristics, brief periods of giving off ammonia, and incomplete treatment are some of the problems that need further research. Experiments were conducted with various styles of rotors. The operating cost for the electrical power to furnish the needed amount of oxygen is estimated at about a half cent per finishing pig per day, based on an electricity rate of 2 cents per kwh. (Sponsored by a Public Health Service research grant from the National Center for Urban and Industrial Health).

67-0332

Feedlot runoff. Public Works, 98(1):118, Jan. 1967.

To develop various techniques to minimize pollution effects of feedlot runoff, the nature of cattle feedlot runoff was determined and factors that influence runoff were evaluated. These studies indicated that runoff from cattle feedlots is a high-strength organic waste produced during and immediately after rainfall. It is further indicated that the greatest pollutant concentrations are obtained during warm weather, during periods of low rainfall intensity, and when the manure has been made soluble by soaking with water. Correlations were developed to predict runoff oxygen demand and nitrogen content based on these factors. Feedlot runoff also contains high concentrations of bacteria. The runoff from a concrete-surfaced lot was more heavily polluted than that from a nonsurfaced lot under similar conditions.

67-0333

Gatehouse, H. C. Disposal of farm effluent: a fresh look at pollution by farm drainage in the light of the Water Resources Act, 1963. Agriculture, 74(2):89-94, Feb. 1967.

The problem of disposal of waste water by agricultural users is reviewed. Just as both grower and grazier are concerned that town sewage and manufacturing wastes discharged upstream from their water source should be purified to acceptable quality before discharge, so they must accept responsibility for preventing pollution by farm drainage. While river authorities have followed a farm drainage policy of sympathetic cooperation and persuasion, they must now move forward with a full program to bring many thousands of outstanding pre-1951 discharges under control. In the River Severn basin, the total volume of sewage and trade waste is 100 million gal a day, and the amount of waste from cattle and pigs is equivalent to 22 million gal a day. This is 20 percent of the total volume of man-made pollution in the river and is significant in view of the dry-weather flow of the river, which is only 250 million gal in the lower reaches. The upper BOD limit of 6 ppm for water for public water supply is exceeded at times in the Severn. Projects under construction or in planning will remove 180 million gal of water from the River Severn a day, so that water must be re-used many times on its way to the sea, and pollution prevention is an unavoidable necessity.

67-0334

Gibson, E. A. Disposal of farm effluent. Agriculture, 74(4):183-188, Apr. 1967.

Since many infections of farm livestock are spread in their excreta, it seems possible that slurry systems of manure handling could increase the disease hazard. The various hazards are discussed in an attempt to place them in perspective. Fortunately, there are only three important infections (salmonella infection, Johnes disease, and anthrax) which would survive storage in the slurry tank and then after spreading survive in sufficient numbers to be infective in the herbage of fodder crop when contact is made with the animal host. It is suggested that effluents thought to contain salmonella should not be applied to pasture or fodder crops that will be used for cattle or sheep within 6 months. The precautions should only be applied when it is known or suspected that infection is present. The effluent from a duck rearing unit and that from purchased calves usually would be suspect. The same precautions should be applied to Johnes disease except that cattle should not be grazed on the pasture for a year. In the case of anthrax, all contaminated material should be disposed of by the methods specified in the Anthrax Order and should not be put on arable or pasture land. Other infections and danger from the release of toxic gases from slurry tanks are briefly discussed.

67-0335

Gray, S. T. Disposal of farm effluent. Agriculture, 74(5):41-44, May 1967.

An important concern of local government is that farm effluents should be disposed of so as not to produce a nuisance or health hazard. Planning in the location of slurry tanks in relation to dwellings and the prevailing wind may avoid discomfort on the part of neighbors and official investigation. With the wet or slurry system, which presents odor problems quite unlike those of traditional rural odors, storage tanks should be large enough so that spraying under unsuitable weather conditions may be avoided and to ensure that the wind is in the right direction when the tanks are emptied. It is also possible to empty tanks frequently to avoid a septic slurry. The disposal of poultry manure by the use of drying plants has advantages. Manure treatment at the source by the open ditch method (Pasveer ditch) may provide an answer to the manure disposal problem in intensive pig holdings, although careful control is necessary. The nuisance provisions of the Public Health Act of 1936 apply to nuisances or unsatisfactory conditions arising from farm effluents. Whatever the sympathies of the rural authorities in regard to the existence of a statutory nuisance, their duty is to the public as a whole.

67-0336

Gribble, D. J. Manure slurry storage, processing and pumping. ASAE Paper No. 67-926. Presented at 61st Annual Meeting, American Society of Agricultural Engineers, Detroit, Dec. 12-15, 1967. 4 p.

Wherever feasible, pumping manure at high pressure through an aluminum irrigation pipe to an especially designed manure sprinkler is the best method of handling farm waste. The following qualifications must be met for this method to work satisfactorily: there must be farm land nearby; there must be a long season with temperatures above freezing; and there must be an adequate supply of water. The advantages of pumping and sprinkling are: fertilizer is returned to the soil in the best possible form; the slurry is stored for short periods; there is a significant labor saving over other methods of waste handling; and fly breeding and other pests are discouraged. The mechanical problems of handling a water, manure, bedding, and feed slurry are: the slurry must be continuously agitated during the pumping period; separation of foreign material must be accomplished; a method of cutting up pieces of hay and silage must be provided; a pump that can handle large solid objects and develop high pressure is necessary; a sprinkler that can dispense large solid objects is needed; and the system must insure an adequate water velocity. A combination of equipment designed to handle these problems is described.

67-0337

Hart, S. A. The old gray mare's waste ain't what it used to be. Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. E-11.

Cooperation between sanitary and agricultural engineers has begun in the alleviation of present problems, but planning for the future is also needed. Animal production is becoming more concentrated in factorylike operations and waste management techniques can be adapted from industrial practices. Chemical herbicides and insecticides are an agricultural waste problem. Other areas of needed research are: odor control, pesticide degradation studies, development of cooperative municipal-industrial-agricultural solid waste management practices, and research to make wastes more acceptable for agricultural use. Some day agricultural land may be the deposit site of waste; research now is critical.

67-0338

Hermanson, R. E., T. E. Hazen, and H. P. Johnson. A laboratory investigation of the activated-sludge stabilization of swine waste. ASAE Paper No. 67-929. Presented at 61st Annual Meeting, American Society of Agricultural Engineers, Detroit, Dec. 12-15, 1967. 36 p.

The extended-aeration, activated-sludge process for swine waste treatment was investigated in order to develop a mathematical model for the BOD-reduction efficiency of the process. Experimental data were obtained for the treatment of the effluent from an anaerobic swine lagoon. The waste was treated in a continuous-flow, laboratory scale plant that operated in the same manner as a full-scale plant. The system was operated at a mean temperature of 20 C plus or minus ½ C. The contents of the aeration tank were well mixed and supplied with sufficient air. The pH of the mixed liquor remained in the optimum range for biological growth and the influent waste had adequate N and P. The activated sludge was flocculent, odorless, and settled well. Foaming and denitrification were not a problem. The reductions of BOD and suspended solids were satisfactory. The mathematical model was successfully fitted to the data by a non-linear method of least squares that used a trial and error solution based on Hartley's modification of the Gauss-Newton method. It was concluded that excessive solids loss because of denitrification can be avoided by proper design of the sedimentation tank, provided that the flow rate does not vary widely. It is not known whether the experimentally determined constants would be applicable to raw, or settled, swine waste.

67-0339

Hull, R., and D. J. Webb. The effect of subsoiling and different levels of manuring on yields of cereals and sugar beet. Journal of Agricultural Science, 69:183-187, 1967.

An experiment carried out at Broom's Barn from 1962 to 1965 measured the effects of subsoiling on yields in a subsequent crop rotation and on the response to fertilizers. An area of 4½ acres of old, arable clay-loam soil was marked out in eight blocks, each with two plots 200 ft by 44 ft. One of each pair of plots, selected at random, was subsoiled once, working 20 in. deep with tines 4 ft apart. A sequence of wheat, barley, sugarbeet, and lucerne crops was planted in the fourth year. Both small and large dressings of granular compound fertilizer were tested. Although subsoiling had only a small effect on yields and few responses were statistically significant, all were positive. The subsoiled plots consistently outyielded the untreated ones throughout the rotation. The average increases in yield were 0.6 cwt per acre of wheat, 0.4 cwt per acre of barley, and 2.1 cwt per acre of sugar or 0.7 tons per acre of roots. The cash value of the extra yields from two cereals and one sugar beet crop amounted to about £6 per acre compared with costs of subsoiling of about £5 per acre. The yield responses of all crops to extra fertilizer were not greater with than without subsoiling. In contrast, previous cropping and fertilizer usage influenced the optimum dressing of nitrogen for the sugar-beet test crop. The results clearly illustrate that in defining optimum dressings of nitrogen for sugar-beet, previous manuring and cropping of the field must be taken into account, but they provide no evidence that subsoil cultivation is likely to alter fertilizer recommendations.

67-0340

Ito, S. High speed and continuous carbonization of agricultural forestry products wastes: (1) design of equipment and results of running test. Journal of the Fuel Society Japan, 46(478):84-90, 1967.

A carbonization plant for agricultural and forestry products wastes, such as sawdust, chips, and fine waste material, is described and the results obtained using a conical fluidization-bed process are given. The sketches with English captions, include a flow sheet which shows the furnace, the blowers, the cyclones, scrubber, filter, and stack.

Two sketches are given showing the heat balance of the system. Charts are given which show the decomposition of hemlock chips as a function of size, temperature, and time; the feed rate of carbonization; wood dust and charcoal yield at 500 C; the amount of circulation gas and charcoal yield; and the amount of circulation gas and volatile material in charcol. At 2.5 tons per day, wood dusts of 20 percent moisture will give 25 percent charcoal. The equipment can carbonize continuously, and deliver a product of uniform quality in a few minutes, utilizing forestry wastes and agricultural products such as sawdust, chips, and fine waste. With additional equipment, the gas can be used as a by-product fuel, and both liquids and wood tar can be obtained from the gas. (Text-Japanese)

67-0341

Jones, D. D., B. A. Jones, and D. L. Day. Aerobic digestion of cattle wastes. ASAE Paper No. 67-931. Presented at 61st Annual Meeting, American Society of Agricultural Engineers, Detroit, Dec. 12-15, 1967. 12 p.

A laboratory study was made on aerobic digestion of waste from beef and dairy cattle on high-concentrate rations. Aerobic units were constructed in the laboratory to serve as digesters. Manure was added daily to the aeration units for 26 days. After day 25, the digester contents were aerated for several more days to determine the decomposition characteristics of the waste. Three different loading rates were studied for both the beef and dairy manure, in order to determine the optimum loading rate for that waste. An effort was made to simulate, as closely as possible, the actual conditions existing under a slotted floor. The COD-BOD ratio was found by dividing the computed COD concentration by the computed BOD concentration for each day. This ratio was then plotted against time for the entire aeration period. The percent of volatile solids, the percent of BOD reduction, and the food-to-mass ratio curves were likewise found, using the computed values of BOD, COD, VS, and FS concentrations for each day. In the experiment, some solids settled and compacted in the bottoms of the digesters, making it impossible to determine how much of the reduction in organic matter was due to biological activity. It is indicated that some factor other than the air rate controls the settling of solids in livestock waste treatment. Less emphasis should be placed on COD, VS, and FS and more should be placed on the measurement of BOD, which is a better indication of microorganism activity.

67-0342

Kilgarriff, P. J. Dairy factory wastes benefit farms. New Zealand Journal of Agriculture, 114(6):20-21, 23, June 1967.

The 15,000 to 20,000 gal of wastes per day generated by a New Zealand dairy making butter and dried milk powders was a problem because of the need to dispose of the waste quickly without pollution of waterways. The whey from the dairy is now used by local farmers for irrigation and is beneficial to the farms and creates no problems. The dairy supplies the farmers with irrigation pipes and sprinklers, and the whey is delivered to the inlet pipe near the road by milk tankers. The whey is provided to the farmers from September to May, so that the wetness of the farms is not increased in the winter. Three photographs show the application of the whey to pastures by spraying from pipes and directly from a milk tanker. A photograph shows that the clover in the fields treated with whey is larger than in the untreated field and that there are fewer weeds. A table is given which shows the results of soils tests on two farms, before and after the whey had been applied for 1 year. Since one of the farms also applied lime and superphosphate to the soil, the data from that farm is not clearcut, although there was a sudden increase in potash which did not increase in a field not treated with whey. In the other farm, the pH increased from 6.1 to 6.5, the calcium was the same, the potash jumped from 4 to 14, and the phosphate increased from 8 to 9 (no units given). If this disposal system had not been used, an extensive treating plant would have been required.

67-0343

Law, R. E. Public health aspects of factory farming. Public Health Inspector, 76(2):133-143, Nov. 1967.

Intensive husbandry and its effects on poultry, cattle, pigs, and sheep are discussed. The use of antibiotics and caponising substances should be limited. They should not be present in foods for human consumption. Dangers of disease-bearing organisms are mentioned. Data on salmonella are given. The tendency with intensive units is to use slatted floor systems to avoid the need for straw or other bedding and reduce labor costs. Dangers can arise from the gases evolved. To reduce poultry manure to the strength of domestic sewage, it must be diluted 200 to 1; thus the volume to be disposed of is increased. Odors result from storing manure in lagoons. Drying manure produces an odorless product with fertilizer value; the organic material is returned to the land and the disposal problem overcome. Slurry is applied to the land by tanker or pumped directly through irrigation systems. Since the farmer can obtain an inorganic fertilizer which is easy to store, pleasant to handle and free from nuisance, he is reluctant to fertilize with manure and slurry. When animals are kept intensively in unclean conditions, the odors are increased and effluvia from exhaust fans can be intolerable. Regular cleaning reduces the opportunity for flies to breed. The penalty for nuisances under the 1936 Act is inadequate. A maximum fine of £5 and £2 daily is preferable to closing a factory in 1967.

67-0344

Loehr, R. C., and R. W. Agnew. Cattle wastes--pollution and potential treatment. Journal of the Sanitary Engineering Division, Proceedings, American Society of Civil Engineers, 93(SA4):55-72, Aug. 1967.

The treatment and disposal of large quantities of animal wastes became an acute problem, as many farmers changed from pasture to pen confinement. Runoff from feedlots is a significant problem and treatment systems must be able to handle slug loads and flows without causing stream pollution. The various treatment methods investigated included: anaerobic digestion, anaerobic lagoons, aeration, and combined anaerobic-aerobic treatment. Tabulated data indicate that while anaerobic digestion can be successful, the capital and operating costs are greatly in excess of what most feedlot operators can afford. While the utilization of anaerobic lagoons was satisfactory from the standpoint of solids degradation and stabilization, additional treatment of the effluent would be needed prior to release to a receiving stream. The aeration system would result in excessive cost and therefore poor acceptance by the feedlot operator. Data further indicate that the quantity and the undesirable qualities of the wastes from a beef feedlot are such that a combination treatment system offers the most promise. The analysis of a potential combined anaerbic-aerobic system as illustrated by means of a flow sheet, was so encouraging that a field treatment system was put into operation at a beef cattle feedlot near the University of Kansas in August 1966. Results to date have closely followed the results of the laboratory study; detailed results are being compiled and will be evaluated in the near future.

67-0345

Loehr, R. C. Effluent quality from anaerobic lagoons treating feedlot wastes. Journal of the Water Pollution Control Federation, 39(3):384-391, Mar. 1967.

The possibility of anaerobic lagoons offering an approach to the treatment of the tremendous quantities of manure originating from confinement feedlot livestock operations is discussed. Such lagoons provide excellent sedimentation capacity to intercept and separate the heavy manure solids from the liquid associated with their removal from feedlot areas. The major problem described is that, even under equilibrium conditions, the liquid effluent from these anaerobic lagoons could pollute ground and surface waters. Also, temperature variations will alter the effluent quality. Land disposal offers an acceptable method for disposing of settled solids that need to be periodically removed from the lagoon. When used in combination with subsequent units to treat the effluent from the lagoons, anaerobic lagoons will be a useful component process for treating livestock waste with high solid content.

67-0346

Ludington, D. C., A. C. Dale, and D. E. Bloodgood. Storage of poultry manure with minimum odor. ASAE Paper No. 67-932. Presented at 61st Annual Meeting, American Society of Agricultural Engineers, Detroit, Dec. 12-15, 1967. 19 p.

Research was conducted to determine a means by which the odors produced by stored poultry manure could be reduced or eliminated. The description of odor or intensity of odor was limited to hydrogen sulfide. The production of hydrogen sulfide was determined quantitatively and was the parameter for evaluating the success of the system in controlling odors. The ORP (oxidation-reduction potential) of stored poultry manure was controlled by controlling the rate of aeration. An ORP control system was developed to permit the ORP of four chambers to be operated at four different levels of ORP simultaneously. A diagram of the electrical controls is given. Significant quantities of hydrogen sulfide were produced when chicken manure was stored without aeration and insignificant quantities were produced when the manure was stored with aeration. An average of 12.8 cu ft of air per day per chicken, was required to maintain an ORP of -400 mv and to create a situation where no hydrogen sulfide was produced. Chicken manure stored at -400 ORP had a 35.9 percent reduction in volatile solids. Manure stored at zero ORP also produced no odor but had a higher reduction of volatile solids. Accurate measurement of low concentrations of dissolved oxygen in fluid chicken manure was not possible. Ammonia was noticeable in the air leaving chambers 0, -150, -300 and to some extent in chamber -400.

67-0347

Mickelson, R. Dairy wastes and the pollution problem. Manufactured Milk Products Journal, 58(3):8-9, Mar. 1967.

The discussion deals with sewage analysis problems and effects of water pollution, and includes a diagram of a 90-degree V-notch weir proposed for measuring the flow of waste materials. The problem of using or disposing of dairy waste may be classified into two categories: (1) waste material associated with normal plant operations; and (2) the by-products from producing specific food products. When evaluating water pollution, oxygen content is important. On the average, 5 lb of nonfat milk solids per million lb of water is enough to reduce dissolved oxygen from an adequate 8 ppm to a 3 ppm level at which aquatic life is impaired. A simple, inexpensive approach to direct measurement of flow is to use a 90-degree V-notch weir. If the rate of flow in gal per minute is known, lb of waste can be determined, and likewise lb of BOD (bio-chemical oxygen demand). This method is far simpler and quicker than the 20-day BOD test. Thus determining the sewage load, one can compare it with the local treatment plant capacity. This knowledge is significant to the dairy industry, since cheese plants are particularly attractive to small communities that are eager for new industry but are unaware of local sewage capacities.

67-0348

Mills, K. C., and B. F. Parker. Some effects of composition of feed on the biochemical oxygen demand of the excreta produced from this feed. ASAE Paper No. 67-930. Presented at 61st Annual Meeting, American Society of Agricultural Engineers, Detroit, Dec. 12-15, 1967. 13 p.

The oxidation lagoon has been the main aerobic waste treating process used for treating livestock waste. There are many variables associated with the aerobic process in oxidation lagoons including: temperature of the water; oxygen content of the water; depth of the lagoon; the particle size of the waste; mixing; and pH. Three groups of steers were selected at random and each group was put on a different ration and confined in a separate pen. One group was on a grain ration, another on a grain and silage ration, and the third group was on pasture. The biochemical oxgen demand test (BOD) was used to determine the rate of oxidation of each sample. Four BOD tests were conducted for each replication. Test data are presented. The BOD from excreta from steers on grain was significantly higher than from steers on grain and silage or grass. The BOD was higher on a grain and silage ration than on the grass ration. For the same amount of waste from each of the rations, an oxidation lagoon for silage and grain would need to be larger than one of grain. This indicates that the rations fed steers should be considered as a variable in lagoon design.

67-0349
Miner, J. R., and T. E. Hazen.
Alternatives to oxidation ditches under slotted floors. Presented at Waste Management Workshop, Tenth National Pork Industry Conference, Lincoln, Nebraska, Nov. 9, 1967. 14 p.

Swine breeders have been among the leaders in the acceptance of confinement housing. The oxidation ditch beneath slotted floors has not proven a satisfactory solution to the waste problem for all producers. A flowing gutter system is being studied which utilizes a basic building which is a 50 by 120 ft clear span steel frame structure housing about 700 pigs. The pens are 5 by 23 ft in plan with a 1-ft floor slope along the length. The unique feature of the building is the gutter along the lower end of the pens in which water may flow continuously or intermittently for manure removal. The animals in this building are floor fed at the opposite end of the pen. The most striking feature of this building is the lack of manure on the pen floors or on the animals. The animals quickly learn to urinate and defecate in the gutter. The manure is removed before it has time to undergo decomposition and produce odor. The daily manure discharge of 700 finishing swine diluted in 3,500 to 9,500 gal of water is a problem. Once the manure is removed from a confinement building by a water transport system, the problem of animal waste management becomes one of waste treatment in the conventional sense. A treatment scheme is shown schematically in which the manure is carried from the building through an underground pipe to an anaerobic lagoon. Effluent from the lagoon is pumped to an oxidation ditch for polishing treatment. The effluent is a non-odorous, aerobic liquid with a BOD between 40 and 100 mg per liter.

67-0350
Miner, J. R., L. R. Fina, and C. Piatt.
Salmonella infantis in cattle feedlot runoff. Applied Microbiology, 15(3):646-649, May 1967.

As a part of an overall study of the water pollution potential of cattle feedlot runoff, an investigation was made of the salmonellae present in the runoff and its public health significance. Samples of both feedlot litter and runoff from two experimental beef feedlots were taken in July 1966. Twenty-six steers, fed a high grain diet, with no reported symptoms of salmonella infection were purchased June 4 for the investigation. Twenty-six isolates from 14 separate feedlot runoff and litter samples were biochemically confirmed to be salmonella and 10 random isolates, typed serologically, proved to be S. infantis. The regularity with which the salmonella was found indicates that the contamination was not an occasional or chance human contamination. The feedlot runoff must be recognized as potentially implicated with disease since all salmonella are considered pathogenic. The potential hazard would be greater from feedlots located on the water sheds of recreational streams and reservoirs. Inasmuch as all the cattle came from one source and only one salmonella type was isolated, it appears that there was a common source of infection. There are water-quality implications in the increase in size and numbers of commercial feedlot operations. Bacteriological studies down stream from known municipal and industrial waste discharges should include an investigation of feedlot wastes. The finding of specific pathogenic organisms in streams may result from previously unsuspected agricultural runoff.

67-0351
Nemerow, N. L. Poultry processing waste treatment at Millsboro, Delaware. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.526-536.

An integrated poultry operation near Millsboro, Delaware, consists of a hatchery, feedmill, soybean mill, and poultry processing plant. The feathers which constitute about 14 percent of the raw chicken weight and the offal making up 16 percent of the weight are sold. The processing wastewater is screened through four vibrating screens which are cleaned daily. The BOD load for the poultry plant was computed to be 2,550 lb. A two-stage oxidation pond treatment system was chosen. The first stage consists of a baffled, high rate deep pond to allow sedimentation of heavy solids, flotation of grease or feathers which escape preliminary treatment by the screens and flotation unit, and bacterial degradation of the organic matter. The second stage is a shallow photosynthetic pond designed to remove last traces of organic matter and convert inorganic phosphates and ammonia nitrogen to algae mass. The construction cost of the treatment plant was $90,000. The treatment facilities are operating satisfactorily at a BOD loading of about 1,390 lb per day.

67-0352

Niles, C. F. Egg laying house wastes. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.334-341.

An egg production facility at the outskirts of Rockport, Indiana, has approximately 205,000 laying hens in 41 laying houses occupying an acre each. The major source of wastes is the manure which is deposited by the birds in the respective pits and a second source is the unconsumed drinking water supply. Samples of the manure as it was being removed from the pits were obtained and analyzed for solids content and oxygen demand. Previous treatment of wastes utilized two ponds. A dryer was investigated to determine whether or not it could provide a satisfactory method of treating the wastes. After several weeks of operation, it was decided that the disposal of manure by drying and the disposal of hen carcasses by mixing with the manure was a satisfactory method. Six dryers have been obtained and results indicate a production rate of 2,800 lb per day per drier. The dried material is conveyed automatically to a storage bin which has been provided with a bag loader and sealer attached to the hopper gate of the bin. Provision has also been made for bulk discharge from the storage bin for wholesale delivery and disposal of the dried material upon nearby farm land.

67-0353

Quick, A. J. Disposal of farm effluent. Agriculture, 74(8):383-387, Aug. 1967.

The problems involved in the handling of manure become more involved as stocking intensity increases and the systems of housing and feeding change. The dairy farmers are handicapped in disposal of manure by their lack of knowledge of the effect of heavy dressings of slurry on soil structure and plant growth. The system of disposal must also comply with statutory requirements for the safeguard of public health and the prevention of the spread of animal disease. The problem can be approached by applying proven methods of material handling, the identification on each farm of the factors which will determine the most suitable system, and, finally, the selection of the best system from the available alternatives. The method is demonstrated in a practical way by furnishing data on an 80-cow herd in a wet area with loose-housing and parlor system. A table shows the total effluent from the 80-cow herd as 1,250 gal per day. The 2,250 gal per day of rain-water from the roofs and cooling should not be allowed to be mixed with the slurry of washing water. A drawing is given of the construction of an above ground storage for slurry made entirely of railway sleepers. Two tables are given showing the costs of the various disposal systems. The most economic method is that of scraping the effluent down a ramp to an above ground storage compound, such as the railway sleeper-type, and emptying annually with a fore-loader and spreader. Drying of manure would require larger herds and the establishment of a market for the dried manure.

67-0354

Schacht, C. J. Development of liquid-manure-handling equipment. Transactions of the American Society of Agricultural, Engineers, 10(2):161-163, Feb. 1967.

The functions of a liquid-manure system are defined, the types of systems are outlined, and the liquid-manure-handling equipment is discussed. The photographs include an auger agitator mounted in a 24-ft-diameter pit. The agitation of liquid-manure pits is one of the greatest challenges to the equipment manufacturers and the auger has good acceptance since it breaks up the difficult-to-handle clumps or clods. A picture is shown of an 800-gal tank being loaded under vacuum; another photograph shows manure being spread under pressure from a tank truck. A chopper pump is shown which is used to agitate and fill a liquid manure spreader. A manure spreader equipped with an auger which runs the whole length of the spreader and carries the liquid manure to the impeller for spreading is shown which gives spreads up to 35 ft. The function of any well-designed liquid-manure system is to collect and store manure, retain all of its nutrients, and then to move the manure to the field at the optimum time with a minimum of time and expense. The agricultural engineer must design liquid-manure-handling systems to meet requirements for efficient farming as well as to meet emerging legal requirements and to work with State and local officials to define sanitary regulations. Basically, the problem is one of materials handling, with economic considerations, since the material being handled is one which was recently considered worthless and uneconomical to handle.

67-0355

Taiganides, E. P. The battle at the forgotten end. ASAE Paper No. 67-925. Presented at 61st Annual Meeting, American Society of Agricultural Engineers, Detroit, Dec. 12-15, 1967. 8 p.

The generation of animal wastes changed from diffusive to point source generation. The concentration of large quantities of wastes in one spot created transportation, treatment, and disposal problems as well as odor problems. Special pumps have been introduced to handle manure wastes. Research is still needed to study the energy requirement and the basic hydraulics of transporting wastes in slurried or discrete state through pipes. Treatment of manure requires different processes than those used for municipal sewage. Direct utilization of animal wastes on crop fields can create public nuisance or pollution of natural resources. Soil can continue to serve as an effective living filter of animal wastes, not only to abate the potential pollution inherent in the wastes but also to renovate and utilize the conditioning nutrients of these wastes. Other problems relating to agricultural wastes concern phosphorus, crop residues, and fruit and vegetable processing wastes.

67-0356

Taiganides, E. P. Modern methods of animal waste disposal. In Proceedings; 27th Annual Meeting, Nutritional Council of American Feed Manufacturers Association, Chicago, May 22, 1967. p.21-22.

Manure disposal is rapidly becoming one of the modern livestock producer's biggest headaches, as man tries to take full advantage of confinement housing with central feeding, pushbutton operations, and small land area use per animal. An understanding of the properties of animal wastes is essential in the research for effective methods of handling them. The properties of manures can be classified as physical, chemical, and biological. Physical factors, such as weight and moisture content, were originally considered the most pertinent characteristics. Chemical composition has emerged as an equally important property, as have the biological constituents of manure. The physical and chemical properties of animal wastes are affected by the particular characteristics of the animal, the feed ration, and the environment. The wastes from animals in a confinement building will contain all the ingredients of the feed, some of them in their original form, others in a chemically simpler form. Most animal rations include antibiotics for disease control. When large doses of these antibiotics are administered to the animals, a portion of them pass through the digestive tract and, thus, can severely inhibit or at times limit biological treatment of the manure unless the manure is diluted to levels below the toxic concentrations of these antibiotics. In the large production units of the future, manure will be handled both mechanically and hydraulically. Positive research to develop uses rather than disposal of farm wastes will require a coordinate effort by researchers from disciplines related to animal production, engineering, public health, and economics.

67-0357

Tietjen, C. Properties and effects of chicken manure. Landtechnik, 22(21):661-663, Nov. 1967.

Chicken dirt is a useful and economical fertilizer if large surfaces for its use are available, but its damp and viscous consistency presents difficulties in application. The addition of water permits easier application, but presents a storage problem. The amount of manure needed for a specific area depends on its nitrogen content, and over-fertilization has a deleterious effect. Recently the use of dry manure has been found more advantageous. Its ease of handling and application more than compensate for its somewhat lower nitrogen content. Tabulated data present comparisons of the amounts of excrement from different animals and of the composition of fresh and dry chicken dirt. Addition of minerals to the dry manure proved beneficial. Six illustrations showing the effect on plants of various amounts of dry and wet chicken manure with and without addition of minerals proved that only slight additional growth is obtained when a five-fold amount of fertilizer is used, that addition of minerals proved beneficial and the over-fertilization can cause reduction in growth. If an excess of chicken dirt is available, vegetation which requires a higher amount of fertilization should be planted, or it should be buried in layers in a fallow field, where it will eventually benefit the soil.

AUTOMOBILE

67-0358

Asrael, S. J. A new look in foundry steel scrap: quality sheared automobile slabs. Modern Castings, 52(3):130-132, 1967.

The use of guillotine shears, together with oscillators or sorting tables, has permitted volume production of No. 1 and No. 2 grades of steel, with the opportunity for finite physical inspection of each piece of scrap and visually controlled chemical content. The process to produce sheared automobile slabs is described in detail. These slabs are better than No. 2 bundles but may not meet the requirements of a large part of the steel and iron melting industries, which cannot tolerate the non-ferrous attachments included in such a scrap package. A method of standardized processing, which removes a large part of the nonferrous material, is described. The cars are first stripped of nonferrous material in a continuous operation which allows a production rate of a properly cleaned car every 4 or 5 minutes. The stripped cars are then sheared on automatic cycle, and the resulting slabs fall out on an oscillator fitted with two sets of screens with 1/2 in. and 1-1/2 in. holes for ash and glass removal. These sheared auto slabs offer guaranteed, attractive chemistry and an opportunity to make savings of from 30 to 50 percent below the cost of pig iron and worthwhile savings under the cost of other premium scrap grades.

67-0359

Blackpool car disposal problems. Waste Trade World, 111(5):6, 1967.

The disposal of scrap cars at Blackpool, England, which was conducted under contract by Birds Commercial Vehicles Ltd. for the Blackpool Cleansing Department, has created more nuisance complaints than did the presence of the scrap cars. Poor public relations, lack of communication, and contradictory statements by all interested parties complicate the situation. The residents complain that the noise and smoke during the operation is so great that they cannot stand it any more. One Councillor said the noise of petrol tanks blowing up made him think World War III had started. Another Councillor said he would not have voted for the project if he had known such a nuisance was to result. The Director of the Blackpool Cleansing Department said the cars were set on fire at night and early morning so that the contractor could do the main job of disposing of the cars. The contractor claimed that the cars were not being burned except accidently in cutting out the engines and axles prior to baling. The residents claimed that they thought the contractors would just come along and crush the cars and none of them would have agreed to the work if they had known the nuisance which would exist. A new baler was expected which would bale the accumulated scrap and clear the site in a few days. One resident claimed that 400 cars had been dumped and they were coming in thick and fast. The residents do not object to the completion of the job, if it is understood that the job is then finished for good.

67-0360

Car dismantlers are not scrap metal merchants. Waste Trade World, 110(18): 3, 1967.

In a test case decision at Bradford City Court, the magistrates ruled that a group of car dismantlers were not scrap metal merchants. A summons against Autowrex Ltd., Bradford, under the Scrap Metals Dealers Act 1964, for carrying on a business as scrap metal merchants without being registered with Bradford Corp., was dismissed. The court ruled that there must be a buying and selling of scrap metal to be caught by the section of the Act in question, and that the purchase of a motor vehicle still registered as such and complete with a registration book was not a purchase of scrap metal as defined. The evidence of the case was that the condition of the vehicles at the purchasing stage was such that they had not lost their original identity. About a third of those purchased received attention and were resold; the remainder were dismantled and valuable spare parts removed for sale. The unwanted residue, about 5 percent was sold to a scrap metal dealer. The court added that the local authority might well feel that its decision ought to be tested upon appeal, so that a High Court may give a ruling which will be binding upon Magistrates Courts throughout the country.

67-0361

Car fragmentation plant opens next week. Waste Trade World, 111(4):4, 1967.

Descriptions are given of the first plants for the disposal of wrecked automobiles which will soon start operations in Britain: one in Lancashire and one in the London area. Both plants will use a Lindemann unit which can handle a car or even a mini-bus in 15 seconds. The London area installation will rely on squashed cars being brought to them by individual companies. The Lancashire unit will patrol Lancashire, North Wales, the North Midlands, and the West Riding of Yorkshire with six mobile car squashers. They are adaptions of an American 8-wheel articulated trailer capable of carrying 60 cars without their axles or engines. The local councils have invited the company to clear their area of abandoned cars. Both plants will handle 2,000 tons a week, one on a 24-hr-per-day basis and the other on an 8-hr-per-day basis. The car is sliced up between a 3,500 hp hammermill and a serrated edge. While the pieces are being flailed in an enclosed compartment, the fabric and glass are removed by suction as dust. The 4-in. pieces of metal, which are removed through an 8-in. grill, are cleaned of dirt by shaker, of non-ferrous metal by a magnetic separator, and of fabric by incineration or scraping. After a final magnetic separation and shaking, the material is discharged. The processing cost for the Lancashire unit will be £1 per ton for electricity.

67-0362

Civic Trust National Conference on Civic Amenities Act. Public Cleansing, 57(12):662-663, 1967.

The proceedings of a one-day national conference on the Civic Amenities Act at London on October 27, 1967 are reported. One session of the conference was devoted to the problems of disposal of derelict cars and other bulky rubbish. Two papers were presented, giving valuable guidance to local authorities and other concerned parties on the effects of the Act and on methods of dealing with old cars and bulky waste. Provisions by the scrap metal industry for powerful new crushing plants were welcomed. The scale of the scrap metal industry and the old car problem in Europe generally, as well as the importance of high grade scrap to the steel industry, were discussed. A new car pulverizing plant built by Proler Cohen Ltd. in London was described. The plant, which cost £ 1 million, can perform with 30 men the work which can be performed by 600 men using conventional methods, and produces 1,000 tons of high grade scrap per day. The disposal of old furniture, litter collection, and the need for local authorities to cooperate in establishing joint schemes for refuse disposal centers, were also discussed.

67-0363

Conference and controversy. Waste Trade World, 111(2):47, 49, 1967.

In a review of the processing of scrap automobiles, the suggestion is made that car delivery vehicles be used for collecting car wrecks since they travel half their mileage unladen. The influence of noise, dust, smoke, and public nuisance in the selection of locations for the mass conversion of cars into component scrap is to be considered. The potential uses of data processing machinery to assist in the makeup of economic mixed-furnace charges is to be discussed. A review of the recovery of waste chemicals, minerals, and oils by 5,000 British firms indicates that 20 to 30 million tons of recovered material is reused by industry every year. Much of the trade wastes dumped by industry are discarded without knowledge of their value. Scrap tires can be disposed of economically in steam-raising rubber incinerators. Papers are to be given on the possible use of paper, wood, fruit, and vegetable matter, as well as rags, in the building and packaging industries. The control of air pollution problems from melting oily brass and aluminum swarf and the reclamation of insulated cable by trapping the fumes is to be one subject discussed. In addition to technical recovery processes, organization and handling methods are as important to economic operations in the scrap and waste industry as in the more obvious applications of waste and storage.

67-0364

Costly beauty treatment for Colorado scrap yards. Waste Trade Journal, 63(52):15, 1967.

Roadside automobile junkyards, a principal target of the Federal highway beautification campaign, are yielding to government pressure at an increasing rate in Colorado. The State is spending $143,000 on the beautification program this fiscal year; of that sum, 75 percent is a Federal allotment. Under the law, junkyards within 1,000 ft of a Federal highway must be screened or moved. States failing to comply by January 1 may lose 10 percent of their Federal highway allotment. The States are required to use whichever method is cheaper--moving or screening. So far, six Colorado junkyards have been moved, one car at a time, by wreckers. A seventh yard is scheduled to be moved out of sight soon. Chain-link fences are used for screening. To increase the screening effect, strips of green and brown aluminum are laced through every other link of the fence. This costs about $1.25 more a running foot than a plain chain-link fence, which ordinarily costs about $2.25 a running foot. A solid fence would be much more expensive, for it would have to be made strong enough to withstand the full force of windstorms.

67-0365

Council considers car graveyards. Waste Trade World, 111(16):17, 1967.

The problem of the selection and landscaping of sites for abandoned car 'graveyards' is being considered by certain local authorities in Great Britain with the intention of making strong recommendations to the Ministry of Development to control the dumping of old vehicles and to insure that vehicle dumps do not become an eyesore. Recent legislation in the United States concerning the problem of such dumps is described.

67-0366

Creisler, J. Today's pride and joy: tomorrow's refuse problem. Public Works, 98(1):65-68, 1967.

The problem of abandoned car bodies in Del Norte County, California, is discussed. Sources of car bodies, in order of importance, are: the abandoned vehicle left on public or private property; the 'do-it-yourself' wrecker who strips and salvages, but does not clean up or remove the worthless, leftover junk; and the commercial dismantler who has no profitable market for certain kinds of scrap. The processing of abandoned vehicles is a law enforcement responsibility in this State. For 'do-it-yourself' wreckers, the law allows an individual to dismantle not more than three personal vehicles in a year, but does not provide for the cleanup or removal of vehicles thus stripped. For abandoned vehicles, a licensed dismantler or commercial garage owner is contacted to pick them up and store them on his own property or in a public impound area. However, due to the unfavorable demand of commercial markets for scrap, the facilities of such firms are saturated with scrap vehicles, and pickups of abandoned vehicles tagged by the law enforcement agencies are no longer feasible. A local program informing the public how to get rid of scrap vehicles had little effect. Legislation was then passed by the State Legislature but was declared unenforceable due to the lack of legal definition for identifiable and unidentifiable vehicles and to the lack of a cross-reference to the Penal Code. Finally, the authorization of waste disposal sites met with some success, and at present there is one supervised site in the County for the public disposal of car bodies.

67-0367

Derrickson, G. F. Motor vehicle abandonment in U.S. urban areas. Washington, U.S. Government Printing Office, Mar. 1967. 51 p.

Questionnaires were sent to 395 cities as part of a study to provide empirical information on the extent of motor vehicle abandonment in urban areas of the U.S. Estimates show total abandonments of 828,000 in 1965. Only about 10 percent of retired vehicles are abandoned. Data were also collected on backlogs of abandoned vehicles, age of vehicles, reasons for abandonment, methods of locating, speed of removal, identifying and contacting abandoners, lengths of impounding periods, methods of removal, disposal of vehicles, adequacy of laws, and adverse effects of air pollution on the junk vehicle problem. It was recommended that city and State laws provide clear authorization for the removal of abandoned vehicles; that vehicles be differentiated by value; impounding periods be reduced so that they do not exceed 30 days; that open burning be allowed on a restricted basis; that shredders be developed that do not require preburning; and that incinerators be developed for scrap processors. Data taken from the questionnaires are tabulated and the questionnaire form is appended. Suggested State legislation for abandoned motor vehicles is also included.

67-0368

Disposal of abandoned vehicles and other refuse. [Great Britain] Civic Amenities Act 1967. chap.69. London, Her Majesty's Stationery Office, 1967. p.13-22.

The Act makes provision for the orderly disposal of abandoned vehicles and equipment and other rubbish. It is the duty of a local authority to provide places where refuse may be deposited at all reasonable times free of charge by persons who reside in the area of the authority. This does not apply to refuse that should be disposed of in the course of a business. Any person who, without lawful authority, abandons a motor vehicle or other articles on any land or on a highway, shall be guilty of an offence. The offender will be liable on summary conviction to a fine of an amount not exceeding £100. In the case of a second or subsequent conviction, the penalty will be a fine of up to two hundred pounds or imprisonment not exceeding 3 months, or both. When it appears that a vehicle is abandoned, it is the duty of the local authority to remove the vehicle. A notice is affixed to the vehicle (for a prescribed period) stating that the authority proposes to remove the vehicle for destruction on the expiration of a prescribed period. The council of a county borough or county district, or the Greater London Council may dispose of the vehicle in any manner they think fit. If the vehicle is claimed by the owner, he must pay to the council such sums as used for its removal and storage. When an article is abandoned on the land or on a highway, the lawful authority may remove the article. The local authority is entitled to recover the cost of removing and disposing of an article from the person by whom it was abandoned.

67-0369

Disposal of automobile scrap in Connecticut. Hartford, Connecticut Development Commission, Feb. 1967. 97 p.

The scrap processing and automobile wrecking industries are summarized. Conclusions are made concerning scrap consumption and demand. Recommendations for legislation and technological development, and factors contributing to the nationwide problem are presented. Data on the scrap cycle is included. Technological development and equipment, as well as data on future scrap production and price, are revealed. Connecticut automobile wreckers and scrap processors were surveyed. Other studies on auto scrap disposal include: 'Twelfth Biennial Report of the Connecticut Legislative Council,' 'Case Studies of the Factors that Influence the Movement of Automobile Scrap,' 'Ways to Remove and Process Junked Car Bodies in a 38-County Area of Eastern Kentucky,' 'Removal of Junked Autos from the Miami-West Palm Beach Area,' 'The Auto Junkyard Problem in Municipalities,' 'Community Solid Waste Practices,' 'Federal Grants to Survey Solid Waste Practices,' and a Connecticut Highway Department survey. Hartford, Vermont, New York, Pennsylvania, and Tennessee have conducted similar studies. The appendix contains a questionnaire for processors, one for wreckers and a table locating shredders in the United States.

67-0370

General recommendations. In Disposal of automobile scrap in Connecticut. Hartford, Connecticut Development Commission, Feb. 1967. p.B1-B10.

Efforts should be made to encourage construction of smokeless incinerators near baling presses. Funds for researching means of removing and processing junked automobiles are available from: Connecticut Research Commission, Economic Development Act of 1965, Solid Waste Disposal Act of 1965, and U. S. Bureau of Mines. An auto scrap disposal technologist should survey the towns to determine the number and location of junked automobiles and encourage wreckers and processors to buy the necessary equipment and to operate efficiently. He should assist wreckers and processors in obtaining loans or grants. Planning agencies should locate shredders and large baling presses in various parts of the State so that auto bodies need not be shipped over 25 miles to be processed. The region around Hartford generates the most scrap. A 35,000 to 50,000-car-per-year capacity shredder costing under $500,000 should be installed by 1968. A 20,000-car-per-year capacity shredder costing about $350,000 should be installed in the Central Naugatuck Valley and the Torrington-Winchester Planning Region by January, 1970. Smokeless incinerators are needed in New Haven and Bridgeport areas. An electric furnace type steel mill which uses 98 percent scrap metal should be established. Prior to installation of private disposal facilities, the towns can rent a portable car crusher and flatbed trailer to transport the bodies to existing facilities in Connecticut and Massachusetts. Data on distance and cost is given.

67-0371

Fast unloading--good prices. Waste Trade World, 111(3):3-4, 1967.

The Proler plant in North London which turns wrecked cars into low grade metal of uniform size and cleanliness is discussed. Such large quantities of scrap are handled so efficiently that upwards of £ 10s can be paid to merchants bringing cars in. All light iron from vehicles of any size able to fit on the 8-ft-wide feeder belt can be absorbed. Before processing, the petrol tank and engine block are removed. Cars can be delivered in any condition although they are flattened before processing. The Greater London Council supplies a large portion of the plant's input capacity; however, merchants in the Southwest and Midlands send cars by rail. Cars from nearby areas are brought by lorry. Imported U.S. cranes are used for off-loading. Estimated time required to enter the area, have 12 or so car bodies removed, and the return across the weigh bridge to receive payment is about 10 minutes.

67-0372

Fragmentation plant crushes cars into pellets. Machinery Market, (3493):37, 1967.

A plant that fragments cars, stoves, washing machines, and other light machinery into pellets is described. The plant, which is the first of its kind, cost £500,000 and has been in experimental operation a short time. Crab cranes feed the scrap cars into a huge, box-shaped receptacle with a 'lid' which comes down under pressure. Whole cars, minus the fuel tanks, tires, and engines, are fed into the hammermill and fragmented into thousands of teacup size particles. Rubber, glass, wood, and nonferrous metals are progressively eliminated as the material passes over grilles and shakers. A 3,200 hp motor drives the hammers. In addition to steel, metals such as copper, aluminum, lead and zinc are reclaimed. The plant also has six flattening machines and a fleet of car 'bashers' which will service an area where the number of cars reaches a minumum of 200. The flattened car bodies are then stacked on transporters and conveyed to the plant. The plant has dealt with 35 tons an hr, but it can probably handle 50 tons an hr. Although the present rate of throughput is about 1,000 tons a week, the aim is 2,500 tons a week.

67-0373

Fragmentation yields high quality scrap. British Steelmaker, 33(12):35, 1967.

The first operational car fragmentation plant in Great Britain is described. It is of Lindemann-Newell design and is capable of producing up to five 500-ton trainloads of first-sized scrap steel per week. It reduces a vehicle to scrap particles in 15 seconds through separation and breakdown. Scrap is fed into the plant by one of two Poclain TY45 mobile cranes, one equipped with a grab and the other with a magnet. The tires, engine, and gas tank of a car are first removed; the car then passes into the crusher unit where it is broken up into fragments. A magnetic separator and a screening unit are used to separate out the nonferrous material, and a kiln unit is used to further purify the scrap metal. Recovered copper, aluminum, lead, zinc, and steel are claimed to be of the finest quality. In addition, scrapyard sites can obtain the services of a car-crusher which will flatten vehicles to allow up to 60 car bodies to be transported by road to the fragmentation plant. The plant cost was £500,000. The placement of three additional fragmentation plants, now under construction, to handle the growing problem of scrap cars, is discussed.

67-0374
GLC plan for old cars. Public Cleansing, 57(3):134, 1967.

People are urged to bring their old cars and other large metal objects to the GLC assembly depots. From there, they are removed by the contractors for pulverization. Last year 35,000 cars were disposed of by the London Borough Councils out of a total of 170,000 which went for scrap in Greater London. It is estimated that by 1970 those councils will be handling about 50,000.

67-0375
GLC proposals on disposal of abandoned motor vehicles. Surveyor and Municipal Engineer, 130(3939):25, 1967.

An item on the disposal of abandoned motor vehicles, which appeared on the agenda of the Oct. 25 meeting of the Works Committee of the London Boroughs Association, is reported. Under new legislation, local authorities can free their districts of abandoned motor vehicles by arranging to have them disposed of. Methods of doing so are discussed. The City Corporation and London Borough Councils (the present refuse collection authorities), along with the GLC (the refuse disposal authority) will have powers under the Act. Ownership inquiries and financial arrangements are mentioned.

67-0376
Jablonowski, E. J., M. G. Roth, and R. W. Hale. The removal and utilization of junked automobiles in Eastern Kentucky; final report. Columbus, Battelle Memorial Institute, Mar. 1967. 70 p.

Abandoned automobiles on or near public roads and junkers located in small and remote yards in 36 counties in the Appalachian Region of eastern Kentucky were considered in the study. The primary objective of the study was to restore the natural beauty of the area, increase employment opportunities for local residents through the collection and disposal of obsolete automobiles, and increase utilization of the materials from obsolete cars. The research procedure involved a review of published information, interviews with key personnel interested in the problem, and observations of the problem by extensive travel through the study area. Information obtained from the study included: estimates of the processing facilities of the scrap industry in the area; estimates of the magnitude of the junk-car problem; identification of the complexities of scrap transportation, junk-car values, location, and density; scrap processing equipment and operating costs; the pattern of scrap movement; type and number of existing programs; and the feasibility of recommended plans for the removal of junkers. A plan of collection and disposition was recommended whereby the resources of the Kentucky State Highway Department, the labor resource of Work and Experience Program personnel, and nominal capital equipment needs would provide the basis for the clean-up program. Appendices include information and data on transportation, including rail rates, the junked-car field survey, and scrap-processing equipment.

67-0377
Jablonowski, E. J., M. G. Roth, and R. W. Hale. Collection and utilization of junk cars--a recommended solution. In The removal and utilization of junked automobiles in Eastern Kentucky; final report. Columbus, Battelle Memorial Institute, Mar. 1967. p.43-70.

It was concluded that no junker removal and utilization program appears to be economically self-sustaining. A program was recommended that would utilize labor personnel of the Work and Experience Program, one of several federally supported War on Poverty programs. The abandoned automobiles would be disposed of immediately by sale to scrap processors. A program of collection, storage, flattening and truck transport to the scrap processor has merit in addition to being the program of lowest net deficit. With a junker accumulation of 5,000 cars per year, it is estimated that the recommended program must be maintained for at least 3 years. The total cost of the program is $35,417. Other approaches which could be used to supplement the primary recommendation include: legislation; education of the public; bounties of up to $10 per car to encourage collection of abandoned cars; subsidizing of collectors' and scrap processors' activities; use of junked automobiles in work projects such as erosion control; socio-economic development of the area; research on uses of scrap; and upgrading of scrap quality.

67-0378

Kurtzweg, J. Regulation of auto wrecking yards. Seattle, Puget Sound Governmental Conference--Puget Sound Regional Planning Council, Mar. 1967. 31 p.

Problems associated with auto wrecking yard operations are discussed and possible means of regulation to counter some of these problems are offered. First a broad overview of some of the problems encountered in disposing of inoperative motor vehicles is given, which provides a basis for consideration of material which deals specifically with the regulation of the location and operation of the automobile wrecking yard. The definitions of the following terms are offered to clarify the difference between various land uses mentioned: scrap processing operations; junkyards; automobile graveyard; and automobile wrecking yard. A list of sources is appended which covers publications issued by national conferences, the Federal Government, and the States of Pennsylvania, Colorado, Illinois, Tennessee, and Washington.

67-0379

Kurtzweg, J. Summary and recommendations. In Regulation of auto wrecking yards. Seattle, Puget Sound Governmental Conference--Puget Sound Regional Planning Council, Mar. 1967. p.iv-vi.

The following recommendations were made: Research aimed at making auto scrap a more competitive raw material should be continued and expanded. Certification of wrecking yard location by the local planning body should be a prerequisite to granting of a State license. Sanctions for violation of wrecking regulations should be included within the State motor vehicle laws. Roadside controls should be established along all highways within the State of Washington. Zoning should be used to specify the location, setback requirements, and performance standards for wrecking yards, scrap processing facilities, garbage dumps and sanitary landfills. Titling procedures should be simplified to facilitate the disposal of vehicles. And air pollution controls should be established on a region-wide basis.

67-0380

Latest lap in car wreck race. Waste Trade World, 3(9):4, 1967.

Although Fragmentation Heckett Bird Ltd. has already put cars through their derelict processing plant at St. Helens, the first in Britain to be in quantity production will be W. C. Jones and Co. Ltd, at Waltham Cross, just outside of London. The latter firm is having a trial run and expects to have their plant working at capacity from their stock of derelict cars soon after the Bank Holiday. The only difference between the plants is the financing. The W. C. Jones and Co. financed themselves, while the Fragmentation Heckett Bird Ltd. is a consortium including the Bird Group and the Spencer Works of Richard Thomas and Baldwins Ltd., which guarantees their market. The Jones plant, capable of processing 60 cars an hr, still does not have a basis for prices they can offer, although there is a tentative offer of £5 per car including the front and back axles, but not the tank, engine, and tires. The uncertainty as to price results from both plants being the first examples of the sophisticated Lindemann version of the basic Newell process, and it is not known how often a shutdown will be required to rebuild the hammers. In a Newell plant in the United States, hammer repairs which take 4 hr are required for every 8 hr of use. It is hoped that experimentation with hammer weights will cut down on the hammer repair. Jones will not be in the market for car bodies until they use up a month's stock, and by that time they may be able to establish a price. Once the trial period is over they plan to make appeals for car bodies by television.

67-0381

Lindemann car shredder plants to operate in Britain. Public Cleansing, 57(10): 520-521, 1967.

Two Lindemann Newell car shredder plants are expected to be operational by the end of the year: one at St. Helens, Lancashire, and the other at Waltham Cross, Herts. A model of the shredder plant is provided. The 20-ft-long feeding bed has a lid which flattens the cars and a hydraulic ram pushes the cake into the shredder where the car is turned into fist-sized pieces of scrap. In tests so far, cars have been reduced in an average of 15 seconds per car. This new system of fragmentizing cars yields scrap of the shape and quality which has been requested by the steel industry for a long time.

67-0382

London's first mass scrap car processing plant. Surveyor and Municipal Engineer, 129(3919):25-6, 1967.

The Proler-Cohen Ŀ1 million mass scrap car processing plant, which will be operational in the late fall with a capacity of 1,500 cars a day, is described. The location at the British Railways shed and sidings area is being developed in cooperation with the British Railways. In addition to unwanted cars, the plant will deal with difficult scrap such as bathtubs, refrigerators, and castings, and the whole 1,000 tons a day will be shipped by rail to the steel plants. The Proler continuous, fully-automatic process needs only 26 men including maintenance and office help. Lorries and trailers with scrap cars and miscellaneous light iron will be off-loaded with two pedestal cranes. The cranes straddle the 8-ft-wide-apron conveyor which drops the cars 40 ft into the disintegrator which in a few seconds reduces them to fragments. The fragments will pass through dirt and metal separation operations before the clean scrap is automatically charged into 16-ton rail wagons. The noise is negligible and atmospheric pollution is controlled by an efficient filtration system. The company hopes to have local authorities in the Midlands and the southwest ship scrap cars by rail. With a simple flattening press costing under Ŀ1,000, the cars could be pancaked and loaded on rail-freight trucks for shipment to the Proler site. The original of the plant has been in operation for some time in the United States. This plant will be the largest in Europe when completed and the scrap steel will be of the highest quality, fist-sized, and free of non-ferrous metals, nonmetallics, dirt, and grease.

67-0383

Markets for scrapped autos. American City, 82(1):111, 1967.

A technique to make auto scrap more acceptable to iron foundries by removing the copper from it is being studied by the Pittsburgh Plate Glass Co. under an $18,000 contract from the Department of the Interior. This could reduce the number of autos abandoned on city streets.

67-0384

New moves to beat scrap car menace. Waste Trade World, 110(5):3-4, 1967.

At a conference called to deal with the problems involved in dumping old cars in Lindsey, Lincs, it was decided to study five aspects of the problem: (1) the number of vehicles requiring disposal each year, including future projections; (2) the requirements which are necessary throughout Lindsey for dealing with this number; (3) location and suitability of existing scrap metal storage disposal sites and possibilities for additional land; (4) legal and procedural problems; and (5) financial implications. The Greater London Council has invited bids for handling about 170,000 cars annually, probably rising to 250,000 by 1970. Various companies that are in the process of setting up plants which would convert large numbers of old cars into scrap are described, including the Cohens with the Proler plant, W. C.

Jones and Co. with the Lindemann-Newell car breaker, and Manchester Corporation with a Mosely Snippy and two small presses.

67-0385

New scrap processing plant. Waste Trade World, 110(12):4, 1967.

A new plant for the fragmentation of scrap metals, which will reduce a complete car to pieces no larger than a tea cup in 30 seconds, is to be developed and operated at a former railway wagon sheet works at St. Helens, Lancashire. British Rail has sold an 8-acre site to Fragmentation Heckett Birds Ltd., of Stratford-upon-Avon, which will install a new type of plant to process old motor cars and industrial and domestic scrap into clean, dense material. An output of 2,000 tons per week from the new plant will be sent in trainloads to steelworks in the United Kingdom or to ports for export. The site sale was completed recently at British Rail headquarters in London, when contracts were signed by Mr. Philip H. Shirley, vice-president of British Railways Board, and Mr. W. T. Bird, Jr., managing director of Fragmentation Heckett Birds Ltd., and the Bird Group of Companies. The plant will be conveniently sited to deal with abandoned vehicles in Lancashire, Yorkshire, the North Midlands and North Wales. After initial treatment the material will be passed through eight separate automatic processes, including a rotary furnace, washers, shakers and mechanical separators, finally emerging as high purity steel scrap, non-ferrous metal, and ashes. The installation will be electrically operated and controlled and the giant hammermill, which will fragmentize complete motor cars, will be driven by a 3,500 hp electric motor. Birds has plans for several similar installations in other parts of the United Kingdom. The new plant will be situated a short distance from St. Helens Junction station and, when fully operational, is expected to provide work for about 50 men.

67-0386

Old gravel pit for junk car disposal. Public Works, 98(1):132, 1967.

During a clean-up program on the reservation of the Colville Confederated Tribes in the State of Washington, many junked automobiles were found. More than 600 cars were disposed of and the dump was covered with an earth fill, after the Washington State Highway Department offered an old gravel borrow pit near Keller as a dump site. The Tribal Council offered $1 per car to stimulate the program and avoid the question of car ownership.

67-0387

Plant, law, Hp, may change scrap car problem. Waste Trade World, 111(13):4-5, 1967.

The authorities in Glasgow have appealed to car owners not to abandon old cars, but to drive them to one of the city's disposal depots. This is the first reported action taken by any local authority under the Civil Amenities Act in effect since July 27, 1967, which provides for a Ł100 fine for abandoning a car. Glasgow has an average of 30 cars abandoned a week, but the number is increasing and the liberalization of installment terms in Great Britain is expected to increase activity in the secondhand car market and thus the number of abandoned cars. A publicity campaign, based on editorials in the local press and possible employment of advertising, is being used to persuade people to consider the possible Ł100 fine and abandon their cars by more orthodox methods. The Greater London Council is still debating the best procedure for enforcing the new Act in view of a contract with the new Proler plant of the George Cohen 600 group to dispose of all vehicles found in the Greater London Area. The Proler plant will not be in full operation until the end of the year. In Birmingham, with up to 400 cars a year abandoned on the streets, the cars are kept up to 4 months unless dismantling has started. In this case, pictures are taken to provide a record in case of claims, and the gas tank is filled with water to protect children from mischief. As a matter of civic responsibility, owners should turn their cars in to the disposal depots before they have been stripped on the streets.

67-0388

Quality scrap from waste cars. Iron and Steel, 40(12):474-476, 1967.

The first fully-operational plant in Great Britain for converting waste cars, stoves, and washing machines into high grade scrap for steelworks is described. Scrap is loaded into the compression box on the hammermill by a crane using a cactus grab. The lid of the box is then lowered, which flattens and compacts the scrap into a slab. Hydraulic rams then push the slab into the hammers which reduce the bulk to pieces about the size of a fist. These pieces drop onto a shaker conveyor which separates out the small pieces from the large. Ferrous material is separated by a magnetic drum separator and is deposited on a conveyor for transport to a rotary burner which removes traces of non-metallic material trapped in the hammered pieces. This is immediately followed by a second magnetic drum separator which lifts the clean ferrous pieces onto a conveyor for carriage to the railway wagons in the adjacent siding. Disposal of nonferrous and other material from the shaker bed and dust and fluff from all stages of operation is described. In addition to the production of good quality steel scrap from waste, the use of this process allows the recovery of many thousands of tons of nonferrous materials. The plant is capable of providing up to five 500-ton trainloads of scrap each week with a density of about 76 lb per cu ft and its initial cost was £5,000,000.

67-0389

Results of U.S. study on automobile dismantling. Waste Trade Journal, 63(52):14, 1967.

Results of a U.S. Bureau of Mines study of classification of metals and non-metals found in cars ready to be scrapped are reported. Each car was weighed and thoroughly steam-cleaned prior to dismantling. The weights and types of metals and nonmetals within each car were determined by dismantling and doing a chemical analysis of samples of the engine, transmission, body, chassis components, and accessories. The major nonferrous metals in automotive scrap are copper, aluminum, nickel, zinc, chromium, and lead. The average weight and composition of metals and nonmetals obtained from five representative cars are tabulated. A conservative estimate of the worth of the various metals is given.

67-0390

Roth, M. G., E. J. Jablonowski, and R. W. Hale. The removal and utilization of junked automobiles in southeastern Florida. Columbus, Battelle Memorial Institute, Apr. 1967. 31 p.

The increase in total automobile population necessarily involves a proportional increase in the number of used cars and junked cars. The blight caused by the junked cars tends to be greatest within urban areas as they continue to grow. This study encompasses the three counties of Dade, Broward, and Palm Beach in southeastern Florida. The objectives of the study were: definition of the size and location of the problem; methods and effectiveness of present approaches being used to remove the cars; and determination of immediate and long-term solutions to the problem. The primary reasons for the accumulation of the cars were found to be antipollution and zoning controls on the collecting and initial processing of cars, and the lack of effectiveness of present approaches to collecting and disposing of cars. Solutions to the problem are given, including: an amendment to present antipollution and zoning laws to permit controlled burning and processing of junked cars; direct subsidizing of collectors and haulers in picking up, transporting, and stripping of junked cars; and support of educational programs to promote community pride and beautification. A recommended program for handling abandoned cars is given. The appendices include methods of collecting and disposing of junked cars in the area of study, and a general description of the designs and operations of the 'Carbeque' and shredding equipment.

67-0391

Roth, M. G., E. J. Jablonowski, and R. W. Hale. Characteristics of the study area. Junk automobiles in urban areas. Effects of pollution and zoning controls. In The removal and utilization of junked automobiles in southeastern Florida; final report. Columbus, Battelle Memorial Institute, Apr. 1967. p.4-14.

The study area consists of the three counties of Dade, Broward, and Palm Beach on the extreme southeast coast of Florida. Some of the various changes that have contributed to the problem of junked and abandoned automobiles include: an increase in automobile registration of 25 percent over the past 5 years; an increase in less skilled and lower income workers; and a reduction in the availability of land and subsequent increases in land values. Field studies indicate that the greater accumulations of junked and abandoned cars are in low-income residential areas or result from the activites of low-income groups. The blight caused by the unsightly hulks is particularly detrimental to the area because of the importance of tourism. The estimated total accumulation of junked and abandoned cars in the study area was 13,000 to 16,500. From field interviews and observations, it was determined that the largest single concentrations of junked cars are in the lower income sections of Miami and Ft. Lauderdale. In general, each of the three counties and most of the incorporated areas have ordinances against burning, and these controls have seriously limited the normal activities and effectiveness of the scrap industry in the study area. Laws restricting the location of certain important segments of the scrap industry have also limited their activities in southeastern Florida.

67-0392

Roth, M. G., E. J. Jablonowski, and R. W. Hale. Present methods of removing and disposing junkers and results. Other methods of disposal. Scrap industry and activities in the area of study. In The removal and utilization of junked automobiles in southeastern Florida; final report. Columbus, Battelle Memorial Institute, Apr. 1967. p.15-26.

The scrap industry in southeastern Florida is concentrated in the major urban areas along the coast. It was estimated by representatives of the scrap industry that less than 300 operations are now collecting and stripping cars. The scrap industry in the area is capable of processing 5,000 to 6,000 tons of auto bodies per month. The primary outlet for the automotive scrap is the export market. There is also a domestic market for automotive scrap in Tampa. Very few shipments have been made to Tampa from the Miami area because the costs of transportation limit the attractiveness of Tampa as a market. The prinicipal reasons for the decline of the scrap industry in the area are the declining market demand and prices, and the controls and restrictions imposed on the industry by the cities and counties in the study area. The total costs for collectors of just the stripping operation are well over the revenues received from processors for the stripped body. Additional costs and, more often, the intangible operating limitations imposed by zoning controls have been a major factor in the reduced activities of collectors and haulers. The greatest difficulty, however, is in the collection and initial processing of junked cars. Other activities of the scrap industry in the study area are discussed.

67-0393

Scrap and waste conference and exhibition. Iron and Steel, 40(10):397-399, 1967.

A paper, 'The Processing of Worn-out and Redundant Automobiles,' presented by A. Cooper at the Scrap and Waste Conference and Exhibition, is summarized. The auto-wrecker first removes from old cars any reusable parts that can be sold and then compresses the body shell to a height of about 12 in. in order to make up a heavy load. The five methods of processing presently being used for the bulk of scrap cars throughout the world are described. The methods are: (1) open burning, oxyacetylene cutting, manual cutting, and hand stripping; (2) baling by means of mobile presses; (3) incineration and baling; (4) incineration and shearing; and (5) fragmentation or shredding. Comments concerning advantages and disadvantages of each method are made. The end products are briefly described and the steelmaker's requirements are considered.

67-0394

Scrap cars--7 million buyers wanted. Waste Trade World, 110(5):12-13, 1967.

The problem of disposing of scrap cars in Great Britain, as well as in other countries, is considered. The number of scrap cars will be increasing dramatically over the next few years, yet because the breaking up process to separate the raw materials and produce a saleable 'clean scrap' is an expensive process, the cars have very little salvage value. Several ways of processing the car once it reaches the breaker's yard are described. The body shell can be burned out before it is cut up by hand and crushed or baled for easy transportation to a steelworks, or the car can be torn to pieces automatically before baling by such machines as the Mosely Snippy, which rips at the body with metal teeth. Another way is to feed the cars into machines which do the whole process, reducing the cars to small-size separated scrap, such as the Lindemann-Newell car breaker, the Proler plant, and the Bulldog Shredder. The portable Al-Jon Type 66-11 car crusher, which can reduce more than 20 cars an hr to 6 in. plates, is currently being demonstrated in France. Plants in France, Japan, and the United States are described, as well as the seriousness of the problem in each country and steps being taken to deal with it. The decline in both the price and demand for ferrous motor scrap in Britain is discussed.

67-0395

Settino, F. A., and E. J. Stofka.
Treatment of molten automotive scrap to reduce copper content; final report.
Pittsburgh, PPG Industries, 1967. 10 p.

The work comprises a feasibility study to assess the results of melting automotive scrap and treating the metal to reduce copper content under production conditions existing at a typical small foundry. Compressed scrap automobile hulks were sheared into 150 lb pieces, melted in a cupola, and the product metal containing approximately 0.4 percent copper, was pigged. These pigs were remelted in a cupola, and the molten metal was treated with chemicals to produce a copper sulfide-bearing slag. Although metal yield was as low as 52 percent in the first attempt, changes in operating conditions with increasing experience improved this, and it is felt that ultimately, recovery of better than 90 percent could be attained. Experimental data and illustrations are appended.

67-0396

Settino, F. A., and E. J. Stofka.
Objective, conclusions, and recommendations. In Treatment of molten automotive scrap to reduce copper content; final report.
Pittsburgh, PPG Industries, 1967. p.1-2.

The objectives are: to determine recovery and metal quality produced by melting 100 percent automotive scrap in a cupola; and to determine effectiveness of copper removal by treating remelted automotive scrap with a slag produced from sodium sulfate, sodium carbonate, and sulfur. The conclusions are: The reduction of the copper level in cast iron can readily be accomplished through the use of a relatively high ratio of a sulfide refining slag to metal and with complete and continued mixing of slag and metal; and a number of problems encountered during the melting of 100 percent automotive scrap can be associated with the lack of experience at PPG Industries with this type of melting. The specific problems are discussed. It is recommended that investigation of slag-metal mixing on a large production scale be done. The results in mixing with compressed gas were particularly favorable. In a cupola of the present design, melting of 100 percent automotive scrap is at best a difficult operation and probably not economically feasible. In melting this scrap, a cupola which could accept a whole automobile bundle is preferred since shearing these bundles produces a more open, less dense charge material which in turn leads to problems in air blast and melting control.

67-0397

Settino, F. A., and E. J. Stofka.
Experimental work. In Treatment of molten automotive scrap to reduce copper content; final report. Pittsburgh, PPG Industries, 1967. p.2-10.

A total of 92 automobiles were crushed and sheared into 150 lb slabs; no cars over 10 years old were used. Prior to crushing, the engine, transmission, radiator, battery, starter, and generator were removed and the automobiles were burned to remove combustibles. The interior heater and the majority of copper wiring was left to provide copper in the product iron. Sodium sulfate, sodium carbonate, and sulfur were used as well as additives such as silicon briquettes, soda ash flux briquettes, and calcium carbide. The experimental procedures are outlined. A total of 102,700 lb of scrap was charged, and 53,570 lb of pig iron containing 0.4 percent copper was recovered. If the recovery had been as high as 75 percent, the resulting copper level would be of the order of 0.2 percent since virtually none of the copper is lost on melting. Subsequent experiments in the production facility confirmed that sodium sulfide slag will reduce the copper content of cast iron. Specialized equipment, including a slag-metal mixing device and exhaust blowers to remove the fumes, and the higher than normal slag requirement, must be considered in evaluating the process.

67-0398

Shredding proposed as only way to process abandoned vehicles. Refuse Removal Journal, 10(11):47, 1967.

The controversy over the Greater London Council's proposed 5-year contract is described. The fragmentation or shredding called for in the new contract is termed discriminatory and unfair to processors using a different system for breaking vehicles. However, this method is cited also as the most advanced for treated scrap cars, having a large throughput and needing fewer operators for a given weight. Another point of contention is the publicity, cited as misleading, which had caused the public to think that the scrap industry is unable to deal with the scrap car problem. One suggestion offered was the use of new car delivery trucks for scrap haulage.

67-0399

Thoughts on car processing. Waste Trade World, 111(17):11-13, 1967.

Questions and answers following a paper on processing abandoned automobiles, which was presented by A. Cooper in conference at the Scrap and Waste Exhibition, are reported. General areas covered in the questioning include: the disposal of gas tanks; the fragmentation or shredding process; the separation of non-ferrous material; the acceptable percentage of copper content in steel; changes in the scrap industry in terms of plant size and machines used; U.S. hammer mills; and the price of shredded scrap compared with that of ordinary scrap.

67-0400

2,000 increase in abandoned cars. Refuse Removal Journal, 10(3):43, 1967.

Exactly 23,795 abandoned cars were removed from New York City streets in 1966. This was an increase of 2,000 over the 1965 figure.

67-0401

U.S. Bureau of Mines. Summary. In Automobile disposal, a national problem. U.S. Bureau of Mines Special Publication No. 1-67. Washington, U.S. Department of the Interior, 1967. p.7-19.

Data compiled in the Bureau of Mines survey of the auto wrecking industry and the ferrous scrap processing industry are tabulated and discussed. There appears to be an adequate market for automotive scrap if price and quality competition is met. Shredders have been successful in processing automotive scrap in some areas. Another approach to the quality problem might be the development of a method for removing copper and other residual contaminants by metallurgical means. Changing technology in scrap processing, changing levels of national economic activity, and changes in automotive design and material specifications all have an effect on automobile scrap accumulation rates. Transportation is also an important element in vehicle disposition. Existing laws and regulations or enforcement practices have a predominant influence on movement and disposal facilities.

67-0402

U.S. Bureau of Mines. Auto sales and scrappage. In Automobile disposal, a national problem. U.S. Bureau of Mines Special Publication No. 1-67. Washington, U.S. Department of the Interior, 1967. p.21-22.

The number of new vehicles sold increased from 6.6 million in 1954 to 11 million in 1965. The number of vehicles scrapped increased from 4.4 million in 1954 to 6.8 million in 1964. For the past 10 years the scrappage rate has averaged about 7 percent of total vehicle registrations. Because trucks have more of a utilitarian value than automobiles, and truck styling does not change at short intervals, they are kept in service longer. Date are given in tabular and graphic form.

67-0403

U.S. Bureau of Mines. Ferrous scrap markets. In Automobile disposal, a national problem. U.S. Bureau of Mines Special Publication No. 1-67. Washington, U.S. Department of the Interior. p.23-30.

The technical and economic aspects of the processes and industries involved in ferrous scrap marketing and consumption and the factors that influence the movement of automotive scrap are highlighted. The principal markets for ferrous scrap are in the United States, with the steel industry the largest of all consumers and the foundry industry the second largest. Domestic scrap and industrial scrap, both of known composition, are preferred by steel mills. Methods are available for the preparation of automotive scrap suitable for feeding into almost any type of furnace, but market volumes in the competitive area often do not justify installation of the necessary equipment. If the price of automotive scrap were to stay relatively the same and the copper content were reduced, it would be bought in preference to other grades of scrap. Outside the United States, West Europe is the largest single scrap-consuming area, with West Germany the largest consumer of iron and steel scrap at 20.8 million metric tons in 1964. Other foreign markets reviewed are: Japan, Taiwan, South Korea, and other Far Eastern countries; Canada and Mexico; India and Turkey; Argentina and Chile; Republic of South Africa, Rhodesia, Ghana, and Egypt; and Australia.

67-0404

U.S. Bureau of Mines. The autowrecking industry. In Automobile disposal, a national problem. U.S. Bureau of Mines Special Publication No. 1-67. Washington, U.S. Department of the Interior, 1967. p.31-40.

Scrap processors estimate that they obtain about three-quarters of their junk vehicles from the more than 10,000 auto wreckers in the United States. The autowrecking industry serves as a gathering place for unwanted, useless wrecked vehicles and as the source of used or rebuilt parts. In larger cities, autowrecking yards are located in or near industrial zoned areas, while in suburbia many yards are located in commercial and residential areas. The transportation of vehicle hulks, operation of yards, equipment used, metal recovery, and preparation of vehicles for disposal to scrap processors are discussed in detail.

67-0405

Vertical vs. hammer crushers. Waste Trade World, 111(18):9, 1967.

An account of the questions and answers following a paper given at the Scrap and Waste Exhibition Conference on the treatment of swarf in the engineering industries is reported. Questions are centered around the vertical type of turning crusher, in contrast to the hammer type, and include advantages, operation, cost, and use in the car industry.

67-0406

Vogely, W. A. Abandoned and scrap automobiles. In L. Weaver, ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.51-60.

The Bureau of Mines' 1965 survey of automobile disposal is discussed. The study showed that in the areas surveyed there was one car to every 2.5 people. The junk inventory was 510,000, of which 73 percent was in auto wreckers' hands, and the remainder abandoned. The study also showed that the junked automobiles which move into the industrial flow (ending in the sale and reuse of scrap metal) through the auto wreckers are accumulating at a low rate. The factors governing the accumulation and disposal of junk cars are discussed. They differ widely from area to area. Cars must be stripped and stored, and ferrous, non-ferrous, and non-metallic parts must be separated. Combustible non-metallics are burned. The operations of scrap collectors, processors, and brokers are described as well as are the influence of transportation costs, location of large scrap processing facilities, and sale of salvage parts on the car scrap market. Legal aspects of car disposal are discussed. Other Bureau of Mines activities in waste disposal are briefly described; e.g. studies of waste disposal in mining and processing operations, and studies of methods for sampling and analyzing municipal incinerator residues (conclusions of this study are given). A method for utilizing steel scrap to release iron from nonmagnetic taconite is outlined. Several Bureau of Mines research grants are listed.

COMPOST/COMPOSTING

67-0407

Answers to a mayor's questions about composting. Compost Science, 7(3):20-21, 1967.

Four equipment manufacturers replied to questions about composting. When asked if the process involved incineration, Fairfield said only to reduce the volume of the 10 percent inorganic material used in a landfill. Metropolitan Waste uses hot dry air for drying the compost. Gruendler uses incineration in a plant operating on reduction. None of the equipment-makers knew of a 600 ton per day plant in successful operation. All agreed that sewage sludge is not necessary to produce a fertilizer of marketable quality. There are holes in the composting equipment, but foul odors are not emitted because ample oxygen is forced through the waste material to prohibit the mass from becoming anerobic. The odors associated with incoming garbage are immediately dissipated when garbage enters the shredding operation and the aeration program begins. The grinding equipment can be located inside a building with sufficient insulation so that the noise level will be acceptable. To accommodate the 10 percent inorganic refuse, Fairfield specifies five acres of landfill for each 100 ton per day of municipal waste. The compost plant is in an area 250 by 350 ft. A 100 ton per day plant can serve 40,000 to 50,000 people. Metro Waste uses 5 acres for a 150 ton plant and one to 2 acres for each additional ton. International Disposal's 100 ton-per-day plant is located on a 3.2 acre site, although the city donated 6 acres.

67-0408

Baddeley, D. C. Engineering equipment used in fully-mechanized composting. Compost Science, 7(3):22-25, 1967.

Composting must result in an innocuous product and be nuisance-free in operation. The refuse is retained at 600 C for pasteurization and to promote aerobic decomposition. Before refuse enters the fermentation units, non-compostables are removed by handpicking or magnetic extraction. After pulverization, water or sewage sludge is added to bring moisture content to 50 percent. Air is injected through pipes for aeration. The Boggianco-Pico plant in Cairo has fermentation in concrete tanks with perforated floors to allow drainage and aeration. Several plants use three to eight-floor digestors. A different type of unit is the Dano Biostabilizer horizontal rotating drum. Air is injected through pipes. The rotation of the drum tumbles the refuse which macerates itself-- a process aggravated by the addition of moisture. In the 'Fermascreen' process maceration and water addition occur simultaneously in the hexagonal drum. Opening the covering door screens allows air exchange. The compost is further refined by reshredding. A 5 to 8 week maturation reduces the carbon-nitrogen ratio from 40 to 15. There are about 200 compost plants in the world. One third practice only maceration followed by windrow composting. Costs range from £1,900 to £3,500 per ton of daily input.

67-0409

Barth, H., and F. W. Brauss. Investigations into the hygiene of fast composting in a rotting tower. Staedtehygiene, 18(4):79-85, 1967.

In the composting process organic material is decomposed by microorganisms. There are various methods of composting. There is the 'Baden-Baden' system where the waste is piled up in a heap. After 6 weeks the pile is turned. After 6 months composting is complete. The waste can go into the heap either crushed or uncrushed. With the Dano method the waste ferments in a rotating drum. The decomposition requires only 4 to 7 days. And finally there is the 'multibacto' method. By this method the waste decomposes as it is slowly passed from shelf to shelf in a rotting tower. The composting plant in Heidelberg, Germany, operates according to the multibacto method. The plant is briefly described and illustrations are given of the process. The waste goes first to a storage room from where it passes to a magnetic drum which separates out all iron parts. On a conveyer belt, rubber, metal, and glass parts are removed from the waste which is then crushed and passed to the rotting tower. The capacity for survival of salmonella in the rotting tower was tested. The waste was innoculated first with Serratia marcescens germs and when it was found that the temperatures arising through the fermentation process had killed them, salmonella were mixed under the waste. They were also killed by the temperatures. (Text-German)

67-0410

Boulder, Colorado passes second compost ordinance. Refuse Removal Journal, 10(2):46, 1967.

Boulder, Colorado, contractors complained because they were required to dispose of refuse they collected by taking it to a composting plant. The cost was higher than that charged for a private landfill.

67-0411

Brown, V. Compost process. In Proceedings; Solid Waste in Urban Environments--a Community Action Seminar, Houston, Mar. 9, 1967. University of Houston. p.48-51.

The Metropolitan Waste Conversion Corporation has constructed and is operating a compost plant to serve a portion of the City of Houston's garbage collection. Under contract to Houston, the plant will accept and process no less than 300 tons per day on a 6-day basis. Since paper constitutes such a large portion of the solid waste collected, large portions of shredded paper have been separated with the help of an airlift and have been burned in a specially designed furnace. The remaining material of 'wet' and other heavy materials, which do not lend themselves to ready combustion are much more adaptable for composting. The feasibility of a double system in a disposal plant, employing incineration for the highly combustible material and composting for that portion which lends itself most easily to the composting process, is easily recognized. Ferrous metal cans are extracted mechanically. Some paper is selectively hand-picked and sold into the secondary markets. The system also absorbs important quantities of Houston's sewage sludge output. The sludge is introduced into the ground material and, by mechanical mixing, is used to raise the moisture level of the aggregate to approximately 60 percent before it is introduced to the digesters. The digesting system is comprised of long tanks into which the ground aggregate is fed by conveyor belts, and which are so constructed that large quantities of air can be vented through the 8-ft deep mass. Within approximately 30 hr, a rapid temperature rise takes place which finally reaches the 155 to 175 F level. After a 5- to 6-day digestive period, the material is removed, ground, and screened.

67-0412

Burger, G. Hygienic recommendations for the planning of composting plants. Hygiene, 13(4):258-260, 1967.

In order to protect the surrounding communities, composting plants should be located at least 500 m from community establishments, at least 100 m from frequented streets, and 1,000 m from food processing plants and water supply works. The prevailing wind direction should be taken into consideration. It is recommended that only a few, but centrally located, composting plants be established, surrounded by spacious grounds to provide space for later extension and reserve storage. The composting plants should also be located in the vicinity of a sewage plant, and should include dump sites or combustion plants for the disposal of non-compostable waste material. Six years prior to putting the composting plants into operation, geological, hydrological, chemical, and microbiological subsoil examinations should be performed. After a suitable site is located, large trees should be planted around its circumference to a depth of 15 m, to create a suitable buffer between the plant and the surrounding area. The maximal groundwater level should be located at least one meter below the site-sole. If the soil contains appreciable amounts of pebble, coarse gravel, and rubble, the groundwater should be protected by the addition of loam, clay, plastic foil, or pavements. For stack-type or pit-type composting plants the heliocentric axis should be taken into consideration. Space should be provided for a small laboratory and rest rooms. (Text-German)

67-0413

Burger, G. Investigation of composting of municipal wastes in a rotting chamber. Zeitschrift fuer die Gesamte Hygiene und Ihre Grenzgebiete, 13(3):192-196, 1967.

Infectious municipal wastes can be disinfected by modern rapid composting only if the correlation between the temperature of decomposition and the duration of effectivity of this temperature in days (d), as given by the function for disinfection, is guaranteed (for bacteria of the TPE group the minimal limit of t is supposed to be higher than 43.3). On this premise the respective investigations revealed a superiority of the rotting chamber procedures, as compared to stack-composting. The process of compost rotting of municipal wastes in closed rotting chambers is completed under a stronger self-heating of the wastes than with the stack-procedures. Higher maximum temperatures are reached. At the same time, bigger compost volumes are exposed to the influence of intensive heating. It is recommended to use heating installations so as to guarantee the disinfecting effect for the colder season, and to be able to heat the cooler marginal zones of the rotting material. The development of heat is impaired by the addition of ashes to the rotting material. For the rotting chambers tested correlations between the ashes content n (%) and the maximum rotting temperature t max (t A = external temperature) were found. Using the function for disinfection, these relations enable the expert to fix the ashes content maximally admissible for epidemic-hygienic reasons. Accordingly, up to (4.25 times t A + 10) percent ashes are admissible for the experimental chambers tested, if all points of the rotting material are to be heated to 50 C for at least 43 hr. (Text-German)

67-0414

Burger, C. The melting test--a simple method for determining the decontamination of aerobic compost. Zeitschrift fuer die Gesamte Hygiene und Ihre Grenzgebiete, 13(7):483-484, 1967.

The rate of deactivation of bacteria by composting depends on the type of pathological bacteria, composting temperature, composition, etc. It has been found that heating of the compost, even for a short duration, to 55 C, deactivates _Mycobacterium tuberculosis_ completely. This has been proved in 38 test series conducted over 5 years. The following simple test was designed for determining whether the compost was deactivated. A test tube containing cotton wool and crystals of a substance melting at 55 C (e.g. 4-amino-diphenyl, 2,5-dichloronitrobenzene, etc.), is immersed in the compost. When the crystals have been absorbed in the cotton wool, the compost may be considered decontaminated. (Text-German)

67-0415

Composting municipal waste. Environmental Science & Technology, 1(2):111, 1967.

The TVA is studying the possibility of composting municipal refuse and sewage sludge to produce soil conditioners and create a new outlet for refuse disposal. The $750,000 project, financed by the Public Health Service, is scheduled to begin operation this spring.

67-0416

Decomposing solid waste by composting. Environmental Science & Technology, 1(5):371, 1967.

The availability of nitrogen in waste materials may be the limiting factor in their decomposition. Research on this idea is being conducted at Battelle Memorial Institute's Columbus Laboratories using a specially designed, hand-fabricated fermentor.

67-0417

Editorial reflections--compost and its problems. Public Cleansing, 57(3):114-116, 1967.

In reference to the charge that there has been no research in the field of composting, several examples were quoted by the publishers. Tests were carried on at Edinburgh School of Agriculture on lead, zinc, and copper; at Sanbury Composting Plant, on levels of toxicity; and large scale experiments by the States of Jersey, concerning the response and growth of crops and estimation of soil analysis. Due to lack of interest and unsteady market, many composting plants end up as pre-treatment plants for refuse. There has been no enthusiasm about composting as a means of land restoration or as a means of refuse disposal either. Composting is only a partial answer and more concentrated interest in technical problems is needed. In America, such investigations form part of the research program on solid wastes which is operated by the Federal Government.

67-0418

First at Epsom. Public Cleansing, 57(9):504-507, 1967.

A new pulverization and composting plant at Epsom, England, which was put into commission on July 3, 1967, is described. The new plant consists of six Fermascreen units and is the first of its type in Great Britain. The design and operation of the plant are described in detail. During the operation, rags, paper, and ferrous material are salvaged and baled. The refuse is initially contained within the Fermascreen for approximately 30 minutes, during which time the Fermascreen is rotated, and water is added to break down the material. After this breakdown period, the hinged doors are opened and the machine automatically screens out all materials of less than 2 in. in size. At the end of the screening period, the reject doors are opened to reject the material which is nonadaptable to treatment. The plant is electrically driven, being controlled from a central panel situated beneath the picking section in the Fermascreen house. Dust extraction, using a wet deduster, is incorporated in the scheme, and large trade waste refuse and bulky wastes are burned in a hand-fed incinerator. The pulverized material is transported to the dumping site for disposal.

67-0419

Gray, K. R. Accelerated composting. Compost Science, 7(3):29-32, 1967.

In nature, plant remains are spontaneously decomposed and transformed into humus under aerobic condition. Rates of decomposition of plant constituents vary greatly. Composting disposes of waste products in a hygienic and efficient manner and also provides humus for the soil. Research is being conducted to: survey existing plants in the United Kingdom and United States; appraise microbiological interactions; and to have experimental runs on a rotating drum composter and a small isothermal reactor. The majority of plants in the United Kingdom are of the Dano Biostabilizer type. In the experimental runs the reactor is a horizontally mounted drum of hexagonal cross-section. One side is a door for filling with fresh material. Moisture content is adjusted to 50 percent. The material is pulverized by rotating the drum for 2 hr, then fermentation and aeration take place. The carbonaceous feed material consists of a mixture of plant remains, leaves and paper. The success of composting will depend on the ability to provide a financial return.

67-0420

Harding, C. I. Recycling and utilization. In L. Weaver, ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.105-119.

The technology of composting is examined. Refuse preparation and product upgrading is briefly described using the plant at Johnson City, Tennessee, as an example. Three mechanical systems are described in detail--the Fairfield system, the International Disposal Corp. system, and the Metrowaste system. Schematic flow diagrams are given. Costs, energy, and manpower requirements are compared. The salvage market is discussed. Prices of various salvage materials are given. Compost marketing and the financing of plants are also discussed. An appendix gives a calculation of area required for a windrow composting plant serving a population of 100,000.

67-0421

Hart, S. A. The proof of the compost pudding is in the utilizing. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. E-10.

Failure of composting operations in the United States is due largely to inadequate outlets for the compost. An analysis of successful composting plants in Germany shows that composting accounts for management of wastes from only 400,000 of the 55,000,000 residents of West Germany. Almost the total volume is used for vineyards, city parks, home gardens, and market fruit. Proposed research into expanding the use of compost into more general agriculture, into the appropriateness of the German practice of incorporating sewage sludge into the compost, and into use of compost or shredded raw refuse in rural, non-agricultural areas is discussed.

67-0422

Hodges, C. R. Composting operations begin at Houston. Compost Science, 7(3):17-19, 1967.

A $1.75 million compost plant is operated in Houston, Texas, by Lone Star Organics, Inc., a subsidiary of Metropolitan Waste. It handles 300 tons of refuse daily, 6 days a week. Metro Waste utilizes the city's sewage sludge to provide moisture and beneficial bacteria for the waste being processed. Refuse is discharged into live hoppers. Salvageable material is removed. Inert non-compostables and non-salvageable items are removed for disposal by landfill. Size of compostables is reduced by grinding. After being mixed with the sewage sludge, the mass moves to the digestor. Air is injected by pressure. After 6 days of digesting, the material is conveyed to the finishing area with temperatures of up to 1,200 F. The compost is sold to nearby rice farmers and citrus growers.

67-0423

Houston forces compost plant shutdown. Refuse Removal Journal, 10(7):6, 36, 1967.

Municipal officials, acting on hundreds of complaints about odors wafting from the facility owned by United Compost Service, Inc. in Houston, have stopped delivering city-collected refuse to the plant, which is located on city-owned land in a residential neighborhood. Neighbors had sought to prevent the plant's construction and then its operation during the 6-day period of trial runs. A second 300-ton composting plant, owned by Metropolitan Waste Conversion Corp., which utilizes raw sewage sludge, is still in operation, although there have been many complaints about it, too. Construction of a third plant, contracted to be built by Norco, does not appear likely, and a high-pressure incineration plant, to be operated privately, has not been built. United Compost estimates the company has invested $1.5 to $2 million so far; the original agreement was that the City would pay $3.47 per ton of refuse delivered, for up to 300 tons daily. The city council's leading proponent for composting plants admits that the Houston program is in trouble.

67-0424

Houter, P.J., and D. W. Stolp. Sale of municipal refuse compost in the Netherlands. In Proceedings; INTAPUC Ninth International Conference, Paris, June 26-30, 1967. International Association of Public Cleansing. p.111-130.

The compost industry in the Netherlands was developed after World War II when fertilizers were rationed. In 1967 there were 16 compost plants in the Netherlands. The market for horticultural and recreation uses has become far greater than the agricultural market, necessitating finer quality composts, free from sharp particles. Peat compost and freshly ground domestic refuse are also produced for these newer, more profitable markets. Sales and promotion methods are discussed. Charts and graphs show market growth, compost use, and distribution and price changes.

67-0425

Johnson & Anderson, Inc., and Ducker Research Co. Economic feasibility study for refuse and sludge composting plant, Riverview, Michigan. Nov. 2, 1967. 61 p.

Supported by a grant from the Public Health Service of the Department of Health, Education, and Welfare, Johnson & Anderson, Inc. investigated the feasibility of composting the solid wastes of Riverview and other communities comprising the Detroit Down River area. The total cost of producing the compost in a 300-ton-per-day plant, including disposal of excess compost, is estimated at between $8.47 and $9.40 per ton of refuse. Income that can be expected from salvaging and from sale of compost is estimated at

$6.74 per ton of refuse. It is expected that an additional income of at least $1.00 per ton of refuse can be expected from the sale of compost after 2 or 3 years of successful plant operations. A map of the area; resumes of capital costs, operating expenses, plant costs, compost transportation costs, and data on income from salvaging; and data on population and refuse produced are included.

67-0426

Johnson & Anderson, Inc., and Ducker Research Co. Marketing study for compost. In Economic feasibility study for refuse and sludge composting plant, Riverview, Michigan. Nov. 2, 1967. p.25-61.

A marketing study for the sale of compost was researched by Ducker Research Company. A brief history of composting and the problems of existing compost plants are reviewed. It was concluded that a specialized market does exist for an annual production of 25,000 tons of compost to be manufactured in Riverview, Michigan, providing the marketing effort is given the same precedence as the design and construction of the plant. There appears to be a market for low-priced organic soil conditioners, low-priced fertilizers containing pelletized compost, and organic base fertilizers made by the Lind Process with fibrous compost bulk. Compost would only be used as landfill until the development of these markets is completed. Data for consumption of organics and conditioners in Michigan and estimated nonfarm fertilizer consumption by regions and states are tabulated.

67-0427

Kean, J. H. Composting. Colorado Municipalities, 43(10):247,256,257, 1967.

The refuse is first separated in a salvage operation. The remaining organic matter is ground and permitted to decompose, thus producing humus. When a composting plant was built in Boulder, Colorado, haulers boycotted it because of the rate (60 cents a cu yd). Since unique wind problems and soil conditions hindered operation of a sanitary landfill, a direct city contract with the plant operators had been formed and since composting is a means of disposal, rates were set accordingly. All the compost the Boulder plant has produced (2,500 tons) has been sold. Odors, flies, and rodents are eliminated. Incoming refuse is dumped into a receiving hopper. Salable items are salvaged. Remaining refuse is ground and windrowed. Within 24 hr, aerobic bacteria action starts and the temperature rises to 90 F. Moisture is added, and the temperature reaches 170 F. Before bagging, the material is screened. The dark-colored humus material end-product looks like loam soil. Adding sewage sludge should improve the economy of the process. Boulder has applied to the federal government to construct, on a demonstration basis, a $1.1 million facility.

67-0428

Leicester's new composting plant now in operation. Surveyor and Municipal Engineer, 130(3940):42, 1967.

Leicester's new composting plant, adjacent to the new sewage treatment works, one of the largest in Europe and the only one in Britain with integrated treatment and disposal of all the household sludge and refuse of a single city, is described. The plant has six Dano drums, 85 ft long and 11 ft 6 in. in diameter. After sorting the household refuse, the organic waste and a predetermined proportion of sludge from the neighboring sewage works is fed into the drums where the mixture is continuously tumbled. Air is injected, causing the temperature to build up to the required 130 F to promote rapid decomposition. The mixture remains in the drums for 4 or 5 days and after being discharged is further screened for items that cannot be composted. The stabilized material is then stored in the open and mechanically turned, aerated, and watered, becoming a soil conditioning compost of high quality. The installed Capacity of the plant is 3,000 kv-a, consisting of 3 transformers, with control largely from a central room in which there is a flow diagram of the whole installation. All motors are started direct on line, the largest ones being 200 hp mounted on three pulverizers. The six stabilizer drums, grouped in three pairs, are powered by 80/40 hp two-speed motors for running the drums fast during the day and slow at night. Six 40 hp motors drive air-cleansing equipment, and other motors, exceeding 150 in number, drive conveyors, magnetic extractors, fans, pumps, balers, etc.

67-0429

Marciszewska-Szoplik, M. A new method to determine the ripeness of compost based on carbon dioxide assay. Gaz, Woda I Technike Sanitarna, 39(8):275-278, 1967.

A new method to determine the ripeness of compost based on carbon dioxide assay is discussed. Isermeyer's method (Z. Pflanzeneraehrung, 56:101, 1952), originally intended only to measure the respiration of the soil and to determine its carbonates, was modified for use in trash and garbage disposal. Solid waste in larger Polish cities is worked into compost in which 50-g samples of the compost used and carbon dioxide development is studied for 140 days. Types of garbage vary greatly in behavior, some producing the gas quite slowly, others producing it quickly and in larger volumes. Compost prepared according to the method described is ready for use after gas generation from a 50-g sample has stabilized at 28 to 34.7 mg carbon dioxide per 24 hr, which usually occurs after 90 to 130 days. (Text-Polish)

67-0430

Municipal compost plant, Auckland: investigations and development. New Zealand Engineering, 22(8):332-333, 1967.

A paper describing the establishment of a pilot composting plant at Auckland, New Zealand, by G. A. Hutchinson (New Zealand Engineering, 21:12, 509-17, Dec. 1966) is discussed. As the result of initial findings from the pilot plant and overseas investigations, the final system selected was a combination of composting, incineration, and sanitary landfill. The twin cylinder Dano composting plant that was installed is described and operating costs are given. Under optimum conditions for bacterial action (optimum moisture content, aeration, and agitation), the natural length of the first stage of fermentation was 5 days. An increase of time in the biostabilizers did not result in any greater breakdown. The lengthening of the 5-day period could not replace later maturing in the windrows, where the material has to reach 150 F to break down to its final earth-like consistency. Incineration was considered a desirable method of disposal, although there was no cheaper method than sanitary landfill when short haul dump sites were available. The bacteria in the refuse were of the thermophilic type and depended for propagation on their supply of oxygen with no acceleration or starter.

67-0431

New hope for composting. American City, 82(4):45, 1967.

A grant from the Office of Solid Wastes has been given to the Columbus Laboratories of Battelle Memorial Institute to study the role of nitrogen-converting microbes in composting. Factors to be investigated include: aeration rates; acidity; temperature; and the effect of fat and oil content. By studying the ecology of the nitrogen cycle during composting, Dr. Knuth, who heads the research team, hopes to suggest modifications in solid waste treatment processes to make the natural process more efficient and improve compost quality.

67-0432

Prescott, J. H. Composting plant converts refuse into organic soil conditioner. Chemical Engineering, 74(23):232-234, 1967.

The operations of a composting plant that mixes refuse with primary sludge from a sewage facility in Houston are described. The odor-free plant now turns 300 tons per day of the city's garbage and refuse into an organic soil conditioner. The $2-million plant was originally designed to handle domestic refuse, but only a relatively small percentage of the material is actual garbage, because of extensive use of garbage disposals in homes. The composition of a typical sample of feed material is given. The various steps in the plant's operation, with accompanying diagrams, are described under the categories of manual sorting, preparing the compost, and digestion and final processing. The processed compost is gray and has a texture similar to that of peat moss. If allowed to bypass drying, the material gradually turns black and assumes the texture of a rich topsoil. Although used as a soil conditioner, the compost has a nitrogen, phosphorous, potassium ratio of 2:1:1, slightly better than steer manure. Consumption of electricity runs to 200,000 kwh per month and that of gas fuel for the dryer is about 1-million cu ft per day. The plant has a master-control board that enables one man to monitor every processing step on closed-circuit TV.

67-0433

Problems beset composting. Refuse Removal Journal, 10(7):12, 1967.

While there is more interest in refuse disposal by composting today, there is little evidence of success. In Houston, three 20-year contracts were signed with privately operated facilities, but only one contractor who processes 300 tons of waste daily appears likely to continue. In Mobile, Alabama, the city-owned composting plant is back in operation after a 5-month shutdown. Florida is the scene for several composting ventures, including an experimental plant at Largo, a major operation at St. Petersburg, one under construction at Gainesville, and one under consideration for Jacksonville and Miami. There are several dismal economic factors in the marketing future of composting; the history of composting abroad is not conducive to optimism either.

67-0434

Prochal, P., S. Polak, and A. Schoenowitz. Effects of preliminary utilization of city refuse in Cracow. Gaz, Woda I Technike Sanitarna, 40(2):57-62, 1967.

Based on West German experience and economic literature (Pfieffer, Straub), the Municipal Council of Cracow decided to adopt composting in the disposal of city refuse and to build a modern composting plant in the Podgorze section during 1966 to 1970. A pilot composting plant was established on 3 ha in Podgorze, and operational data for the 1961 to 1963 period is provided. Altogether, 19 piles were built from city refuse unsorted except for the separation of metal and glass during unloading. Piles were 6 to 20 m long, 2 to 3 m wide and 1.5 m high, with a concave top into which water and sewage were poured. Inside, temperatures were taken every 3 to 5 days and figures 2, 3, and 4 show temperature averages of piles established in 1961, 1962, and 1963, respectively. Initial and terminal temperatures were 36 to 44 C, with a 51 to 66 C range during the peak of the biothermal process. Composting is divided into four phases lasting 97 days in all: pile formation and beginning of the biothermal process for 27 days; intensification of the process for 45 days; maturing of the compost for about 25 days, and storage. Volume of refuse processed (about 3% of Cracow's total) and volume of compost obtained were, in cu m : 3,750 and 1,098 in 1961; 5,145 and 1,516 in 1962; and 6,450 and 1,909 in 1963. Chemical compost values are given in Table 2 and Figure 1. Total 1962 Cracow volume of refuse suitable for composting amounted to 210,000 cu m. Assuming that 22,500 cu m can be processed on 1 ha by the field composting method, Cracow would need at least 9.5 ha for its future composting plant. (Text-Polish)

67-0435

Prochal, P., A. Schoenowitz, and S. Polak. Preliminary agricultural effects obtained by processing composts from the municipal settling tanks of Krakow. Gaz, Woda I Technike Sanitarna, 41(9): 300-304, 1967.

Compost containing 18.5 percent organic material was applied to fields which were overgrown with weeds, to fields from which root crops were harvested and which had lain barren for some time, and also to vegetable plants. The results are presented in tables, in which the costs of the compost (90 zloty per long ton) and the difficulty or ease of application are taken into consideration. It is concluded that the compost does not act solely on the basis of its chemical analysis, but also by biothermal processes, i.e. it develops heat during its decomposition. Best results were obtained with beets, where the yield was raised by 28.5 percent, whereas in the case of winter harvested crops given the same amounts (200 quintals per hectare), the yield increased by only 12.5 percent. Larger amounts, such as 600 quintals per hectare, furnished still better yields; beyond this figure, still larger amounts of compost are wasted. On the basis of these preliminary experiments, the best results (up to 150 percent increase in yield) were obtained with very high doses of compost applied to cauliflower, cabbage, celery, carrots, beets, and parsley; the cost of obtaining such results lies between 5,000 and 70,000 zloty per hectare. (Text-Polish)

67-0436

Pulverising the Tollemache way. Public Cleansing, 57(2):68-70, 1967.

In February, Hadfields Limited purchased controlling interest of Tollemache Composting Systems Limited. During 1966 one static plant was sold to Dorking and Horley R.D.C. Their machine has an output of 15 tons per hr and requires one operator at the control bridge. It is an asbestos-clad framed building with bricks to 6 ft high. The refuse lorries back into the building, tip refuse onto a plate feeder which raises it (unsorted) into the pulverizer. After pulverization, it is fed into a bulk transport vehicle of 35 cu yd capacity or 10 to 11 tons with a density of 5 to 6 cwt per cu yd. Only 1/2 percent of the refuse fed into the machine is rejected and these are mostly heavy metals. The cost of installation is £25,000 complete. Running costs are 1£ per ton of refuse pulverized for hammer wear and the same for electricity. All internal parts of the pulverizer are protected by replaceable or anti-abrasive wear plates. The layout of the plant was designed by Mr. P. Caldwell. A semi-mobile plant is designed for cities who may wish to move their pulverizer from one tip to another. The plant consists of a ballistic separator pulverizer, powered by a Dormans 6LBT, 165 horsepower diesel engine and has a capacity of 15 tons per hr. The material produced can be used for compost. The plant can be housed and can be moved in 2 or 3 days.

67-0437

Ramin, E. Determination of size of stack sites for refuse composting. Zeitschrift fuer Hygiene, 13(11): 826-828, 1967.

A method of determining mathematically the size of stack sites for refuse composting is described. The size of stack sites for composting depends primarily on the quantity of refuse to be composted annually, on the height of the stacks, on the rotting time, and on the shrinkage which occurs during the rotting process. When determining space requirements, room for walks and additional stack space required during rotting delay should be taken into consideration. Values are stated for shrinkage and rotting duration, and the calculations are illustrated by an example. (Text-German)

67-0438

Refuse plant in city park. Public Cleansing, 57(11):570-575, 1967.

The $1,500,000 refuse reclamation plant in St. Petersburg, Florida, which has the capacity to process up to 105 tons of refuse daily, is described. The plant, operated by International Disposal Corporation, is located on a 3.2 acre site in a city park and provides efficient, nuisance-free disposal of city refuse. Disposal of 31,200 tons of refuse a year is accomplished at a cost to the city of $3.24 per delivered ton. Operation of the plant involves both manual and automatic removal of salvageable items such as metals, and the well controlled biological breakdown of the remaining material into an organic compost. The 5-day decomposition process produces from the refuse a clean and acceptable material useful as a natural soil conditioner. Both compost and salvaged materials are marketed by the company in the St. Petersburg area. The many automated features of the plant help keep operating costs low. Key components of the reclamation system are a patented grinder which handles the difficult task of reducing a heterogeneous material to particles of uniform size, and the patented digester process which gives maximum control of the environmental conditions required for optimum decomposition of the wastes into an organic compost free from harmful microorganisms. The process and equipment are described in detail and the plant is illustrated by means of a flow diagram. The final compost has less than 20 percent of the volume of the original refuse; it has a chemical analysis of approximately 1 percent nitrogen, 1 percent phosphorous, and 1 percent potash, with the complete range of trace minerals in smaller but significant quantities.

67-0439
Refuse pulverization and composting at Epsom. Surveyor and Municipal Engineer, 129(3918):16-17, 1967.

The new pulverizing and composting plant installed by the Borough of Epsom and Ewell, which has six Fermascreen units, is described. The refuse vehicles dump directly into a 120-cu yd hopper. After removal of bulky items unacceptable to the plant, the refuse is elevated to the sorting and picking area where various types of salvageable material, with the exception of tins and other ferrous metal, are removed by hand. After picking, the refuse is discharged to the Fermascreens (illustrated) by the belt conveyor tripper (also illustrated). The Fermascreens are fitted with wire mesh screening panels covered by an automatically operated door. After 30 minutes rotation in the Fermascreen with water to break down the material, the door is opened and the machine screens out all materials smaller than 2 in. After screening, the large pieces of wood, plastic, rubber, and stone are removed through the reject doors. The pulverized and reject material passes by conveyor under an overhead electromagnetic separator which discharges the ferrous metals by chute to the metal baling press. The pulverized and reject material is then conveyed to storage for delivery to the vehicles for transfer to the dumping area. The conveyors are enclosed and exhausted to wet dust collectors to control the dust. The metal baler has a capacity of 6 tons a day and the rag baler of one ton a day. Seventy tons of refuse are collected daily from a population of 72,150, and final disposal is in a chalk pit close to a residential area.

67-0440
Spitzer, E. F. Composting works in Houston. American City, 82(10):97-99, 1967.

Metropolitan Waste Conversion Corporation, under contract with the City of Houston, Texas, is operating successfully a compost plant which treats 300 tons of mixed residential and commercial refuse daily, six days a week. Advantages to the city are: (1) Savings of $1 per ton are realized over landfill or incineration disposal. (2) Sewage sludge can be utilized. (3) The contractor rents the land from the city and pays taxes on his plant. (4) The operation is clean and not injurious to health. Site selection is important, since occasionally an odor problem develops, which, however, can be solved if the populace is tolerant and patient. Since marketing the product is still the key to success, the company has initiated research and development projects in regard to the bagging and storing of compost, the marketing and distribution of salvageable material (textiles, aluminum, etc.), and the use of the compost product (e.g. as fertilizer, for hydromulching). The compost product after final grinding sells for $12 per ton in bulk shipments, with no upgrading. The material will be marketed in more than one grade, since it can be upgraded both physically and chemically.

67-0441
Splittstoesser, D. F., and L. M. Massey. Irradiation of composts used in propagation of agaricus bisporus. Applied Microbiology, 15(3):646-649, 1967.

Unpasteurized horse manure composts were given radiation doses of 0.1 and 1.0 Mrad in an attempt to increase mushroom yields by eliminating competing microorganisms. Yields were enhanced by 0.1 Mrad but were lower than those obtained with heat-pasteurized composts. Composts subjected to 1.0 Mrad gave the lowest yields, probably because of the generation of ammonia and other toxic compounds. Only temporary changes in the predominant microflora could be detected as a result of ionizing radiations. Figures and tables show: the effect of radiation and subsequent incubation on mesophillic and thermophilic populations in compost; the effect of mushroom spawn on mesophillic microbial plate counts; the effects of irradiating composts on subsequent mushroom yields and on water-soluble nitrogen content of compost; and the effect of radiation and subsequent incubation on distribution of microbial groups in compost. It was concluded that yields were lower than those provided by pasteurized composts because the radiation doses did not eliminate competing microflora and did not effect other changes favorable to the mushroom.

67-0442
Straub, H. Technical status of the treatment of municipal refuse with a view to its use in agriculture. In Proceedings; INTAPUC Ninth International Conference, Paris, June 26-30, 1967. International Association of Public Cleansing. p.79-110.

Treatment of municipal refuse for use in agriculture must allow the complex organic matter to be broken down for plant assimilation, while eliminating material harmful to plants and livestock. The biological process of composting is outlined and flow charts of various composting processes are given. Composting methods discussed are: composting in windrows without prior preparation of the raw refuse, followed by screening and/or crushing of the compost product; composting in windrows with prior preparation of the raw refuse without subsequent treatment of the compost product; primary composting in fermentation cells followed by composting in windrows; and composting in fermentation cells with prior crushing of the raw refuse, followed by composting in windrows.

67-0443
TVA-PHS to study composting. APWA Reporter, 34(7):25, 1967.

TVA and the U.S. Public Health Service will soon begin operation and research at a composting plant at Johnson City, Tennessee. An $8,000,000 plant, owned by PHS and built and operated by TVA, will be used to seek solutions to problems that have been encountered by composting plants in other parts of the country. TVA has a 7-year contract to operate the plant, which initially will require 11 men to operate it and in normal operation will produce about 25 tons of compost daily.

67-0444
Undertake compost research project. Refuse Removal Journal, 10(1):41, 1967.

Columbus Laboratories of Battelle Memorial Institute under a grant from the Office of Solid Wastes is identifying the numbers and kinds of nitrogen-cycle microorganisms which thrive in compost. Factors to be investigated include aeration rates, acidity, temperature, and the effect of fat and oil content.

67-0445
Wild, H. E. Computers and composting. [Gainesville], University of Florida, 1967. 21 p.

Data available from the Metropolitan Waste Conversion system for composting as used at a Gainesville plant were used with a computer to determine the total costs of composting. Several other types of composting plants are described and the same type of procedure could be used with modifications necessary to each type of unit. The computer program is included in the appendix and the results of trying every variation in size and equipment used for the system are given. The use of the computer to select the best design based on cost is considered feasible and practical. Various suggestions are given for further research into the depth to which compost can be piled and air requirements of the process. Printouts of the information derived from the computer analysis are included for three variations in plant design giving the seven most economical designs for capacities of from 50 to 1,000 tons per day in multiples of 50 for each design.

67-0446
Wild, H. E. Composting processes. In Computers and composting. [Gainesville], University of Florida, 1967. p.1-16.

The theory of composting is briefly considered and diagrams and descriptions of the Fairfield Hardy, Tollemache, and Dano Bio-stabilizer processes are given. These are all horizontal processes. The John Thompson and Naturizer processes, vertical methods in which the mixing of the refuse takes place by virtue of its falling from one level to another by gravity, are also diagrammed and described. The Fermascreen and Metropolitan Waste Conversion schemes are called stationary processes because mixing and aeration of the material is accomplished in a stationary drum which discharges the fermented material. These processes are diagrammed and described.

67-0447
Wild, H. E. Program description. In Computers and composting. [Gainesville], University of Florida, 1967. p.17-20.

A computer program was devised for the Metropolitan Waste Conversion system, for which data were available from the Gainesville composting plant, to determine the size and configuration of this process giving the best economy. Three configurations are considered and the best equipment sizing designs for each capacity from 50 to 1,000 ton per day capacity in multiples of 50 are given. The program and printouts are included in an Appendix.

67-0448
Wiley, J. S., and C. R. Sova. Comprehensive studies in survival of pathogenic organisms in compost. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. E-15.

The United States Public Health Service (Solid Wastes Program) and the Tennessee Valley Authority have constructed a research and demonstration plant to compost the mixed refuse and sewage sludge collected by the city of Johnson City, Tennessee. Quantitative recovery studies of relatively low levels of such pathogens and indicator organisms as the coliforms, fecal coliform (approximating Escherichia coli) Staphylococcus, Salmonella, Bacillus cereus; the enteroviruses, Histoplasma capsulatum, Entamoeba histolytica, and Ascaris lumbricoides will be undertaken to determine the health aspects of composting refuse and sewage sludge. Present indications are that the mixed refuse in a combined collection system by the city results in an average amount of 265 cu yd or 57.5 tons per day with daily fluctuations of plus or minus 53 cu yd per day or plus or minus 11.5 tons per day. The primary sewage treatment plant serves approximately 85 percent of the population or 28,900 and pumps raw sewage sludge to digestion tanks at an average rate of 26,700 gpd. It is estimated that the sludge averages only 1.06 percent solids content on the basis of 0.0817 lb per capita per day of primary sludge.

PROCESSING/REDUCTION

67-0449
Bag tearing machine. Tonindustrie Zeitung und Keramische Rundschau, 91(4):141-142, 1967.

A bag tearing machine has been developed by Johannes Moeller Co., Hamburg, West Germany. The machine tears bags open, empties them, and compacts the paper bags to bales. It is able to process 480 bags per hr at a maximum weight of 50 kg per bag. The bags are torn by two spike rollers. The torn bag and its contents fall into a sieve which retains the paper. In a hydraulic press the paper is subsequently compacted. (Text-German)

67-0450
Baling presses. Waste Trade World, 110(21):13-22, 1967.

Baling presses are discussed in regard to design and use. Several advantages of this means of waste disposal include space saved in storage, improved housekeeping, ease and speed of handling, decreased cost, and reduced fire risk. The two dominant factors determining the most suitable choice of baling press are the type of material to be handled and the quantity. Two other factors to be remembered are the amount of space available and the facilities for handling the finished bales. An explanation is given for: how these factors determine type of power used, e.g. hand press, pneumatic, electric screw, or hydraulic; whether the bales should be handled manually or automatically; and whether the press should be vertical or horizontal. Several examples of each type of press are described, primarily English, Swedish, Swiss, and German products.

67-0451
Bearint, D. E. Densification and size reduction. In Status of unit operations and processes for solid-waste disposal; final report. Columbus, Battelle Memorial Institute, Feb. 19, 1967. p.3-22.

U.S. literature sources were surveyed to document the state of the art of densification and size-reduction equipment as applied to the disposal of solid wastes. The terms 'densification' and 'size reduction' are defined and information sources are listed. Landfill operations employ various machines to increase compaction ratio and reduce the bulk volume of the refuse. Size-reduction equipment has been used in France for two decades and is now being tried in North America. Incinerators use size-reduction equipment to reduce oversize and bulky wastes. Shredding the entire feed to an incinerator has been tried with little success. Composting operations make extensive use of size-reduction equipment, but full-scale, long-term operating experience is lacking. While densification and size-reduction equipment is employed in salvage, its applications are few. Details on equipment are generally not given in the literature and a more extensive program of correspondence and visits to manufacturers, operating sites, and consulting firms is required.

67-0452

Brunt, L. P. Swing-hammer pulverizers. Public Cleansing, 57(10):551-553, 1967.

The effectiveness of various designs of swing hammer pulverizers with regard to glass was discussed. In general, single rotor hammermills with a vertical shaft seem to be able to achieve better results with glass than the type having a horizontal rotor shaft. The effectiveness of a vertical shaft machine might be further enhanced if it had, on the portion of the rotor which faces the discharge opening, hammers in the form of bars parallel to the rotor shaft, but difficulties may be encountered with rags. It is suggested that if the body casing of a horizontal rotor hammermill were continued round in the direction of the hammer rotation until horizontally tangential to that direction, (thus, the discharge opening could be at the side instead of at the bottom of the machine directly opposite to the feed opening), a useful increase in the effective impact surface would be achieved. Hammermills with two horizontal rotors, fed with refuse through a centrally disposed opening below the middle of which the hammers on both rotors are moving downwards, may have initial impacts with a greater shattering effect on glass than is achieved in single-rotor machines, but thereafter there are comparatively small surfaces against which glass fragments may be further shattered by the hammer tips.

67-0453

Burke, J. R., and R. W. Schatz. Separation of solid wastes. In Status of unit operations and processes for solid-waste disposal; final report. Columbus, Battelle Memorial Institute, Feb. 19, 1967. p.23-42.

Technical and economic data, obtained from a literature survey, are included for the various procedures available for treating solid wastes. Before separation can be accomplished, the materials must be reduced in size, classified by size, and/or the solid fraction removed from the fluid medium. Physical sorting can be accomplished by hand or mechanical sorting. Washing and scrubbing techniques are employed to remove minor, fine constituents from the main coarse bulk. Gravity separation includes jigging, tabling, spiraling, and heavy-medium concentration. The simplest illustration of magnetic separation is the common use of a magnet head pulley on a belt to remove cans or tramp iron. The field of application of electrostatic separation is limited to about the size range 20 to 100 mesh. Flotation involves chemical treatment of surfaces in a pulp to create conditions favorable for the attachment of air bubbles to selected particles. Special separation techniques are described for wastepaper processing, foundry waste recycling, and non-ferrous metal recovery.

67-0454

Chews up rubbish. Waste Trade World, 110(15):13, 1967.

Vickers Seerdrum Ltd. have developed a machine that can chew up to 50 cu yd per hr of rubbish straight from the dustbin and turn it into a substance like soil. The substance is said to make excellent compost. An overhead separator removes tins by magnetic attraction, which can be sold for £4 to £6 10s per ton. Nine prototypes are being tried out by local authorities all over Britain, and staff at the Elswick, Newcastle upon Tyne, works of the Vickers

Ltd. Engineering Group, where the machines are built, are planning to produce one a week.

67-0455

Disposal of wastepaper saves money at Columbus, Ohio, post office. Material Handling Engineering, 22(12):85-86, 1967.

A new wastepaper disposal system at the Columbus, Ohio, post office which saves money, space, and time is described. The most dramatic savings are achieved by baling of wastepaper before it is hauled away, rather than hauling the wastepaper loose in hampers. The net amount of space released for other agency use as a result of the baler is 744 sq ft. A new paper room close to the elevator which brings the wastepaper to the basement, and a chute in the paper room which permits hampers to be dumped and baled without delay, save labor. Specific cost savings connected with the baling operation are given. Total savings per year are summarized as follows: $3,331.44 for paper disposal by baling, $2,709.00 for space, and $408.24 for labor, which add up to a total savings of $6,448.68 per year.

67-0456

Fermascreen pulverizing system. Public Cleansing, 57(4):205-208, 1967.

'Fermascreen' can pulverize or compost refuse. The units are charged by direct loading methods. Fermascreen simultaneously performs the duties of reception hopper, mixer, screen, pulverizer, and composting unit. It can process 12 tons per day. The product is dampened and uniform in particle size. Rejects, such as glass, tins, etc., are retained in the drum during the discharge of the pulverized material. The batch loading method gives continuous feed. The pulverization process is effected by the rotation or tumbling action which takes place throughout the complete cycle. Water is added to increase the moisture content of the refuse. Coarse pulverized material is used to cover the tipped rejects. Metals are extracted magnetically. Composting is by the windrow method. The pulverized material is in ideal condition for the natural thermophilic fermentation breakdown. There is no risk of combustion during the overnight storage of refuse because the Fermascreen is sealed when all doors are closed, and water can be quickly and evenly mixed with the refuse.

67-0457

Fullard, A. C. Latest Gondard developments. Public Cleansing, 57(8):443-445, 1967.

The firm of Gondard has developed an integrated refuse-reducing installation consisting of pulverizer, hopper, feed belt, and control. Development of the Gondard refuse reducer at different plants and in different countries is described. In France, the fully automatic control of the earlier model was eliminated and reliance placed on the operator. This proved more economical and throughput was not impaired. Wiesbaden, Germany, has four pulverizer units and plans an additional one in 1968. Daily throughput is 250 tons, rising to 500 tons in the near future. Each layout is automatically controlled, with provisions for manual feed control, if this should become desirable. In Montreal, two Gondards treat 400 tons of refuse per 20-hr day in two shifts. Their system utilizes test hammers of better quality steel at the end of the rotor than in the center. The most recently constructed plant utilizing Gondard units in Great Britain is at Portadown, Ireland. It consists of a 40 cu yd reception hopper with a moving plate conveyor which feeds directly into the pulverizer. The operator can regulate the volume of refuse fed and there is also an automatic control which overrides manual control. A plant in the planning stages at the County Borough of Grimsby includes two Gondard refuse reducers. An interesting feature of the scheme is that one Gondard has a grill to make a coarse end product, while the other has a much narrower grill to obtain a fine end product suitable for topsoiling.

67-0458

Garnett, J. C. This press flattens garbage problems. Civic Administration, 19(12):23, 1967.

Out of a hydraulic press fed 40 cu yd of garbage at a time emerges a 5- to 6-ton, 6 cu yd steel-clad block. To eliminate pollution and odor, the bale can be hot-dipped in bitumastic. Capital cost is half that of an equivalent capacity incinerator. Operating costs would be $2.50 in Canada. The blocks can be used for foundations in boggy areas or for flood control dykes. They may be dumped harmlessly into the ocean or ravines. Press development cost $3 million.

67-0459

Glathe, H., G. Farkasdi, G. Niese, et al. Investigations of the biological processes of the Brikollare method. Staedtehygiene, 15(7):150-155, 1967.

With the Brikollare method a mixture of shredded waste and sewage sludge is pressed, thereby reducing its volume by 50 to 70 percent, densely piled up and dried. In the self-heating process which follows; the temperatures rise to 55 C in the marginal zones and to about 65 C in the interior of the pile, killing all pathogenic germs. To find out what kind of biological and biochemical changes occur during the heating and drying process, various tests have been performed. The carbon dioxide production was measured on various differently treated samples. The results showed a lower carbon dioxide production in samples dried for 2 months by self-heating than in those which developed fungi. This means that part of the organic substance has degenerated during the drying process. The same results were obtained by testing the self-heating ability and in the chemical group analysis. The latter showed, moreover, that organic substances such as sugar, starch, amino acids, pectin, etc., up to hemicellulose are decomposed in the first stage of drying, cellulose and proteins in the second stage. The microflora which were observed to develop in the pile mainly consisted of actinomycetes and fungi building up on hydrocarbons. Almost no cellulose splitting species were found. Experiments to determine fertilizing effects of small pieces of Brikollare in soil have been conducted in small glass containers at constant temperature (25 C) and humidity (60%). After 10, 20, 40, and 70 days the ammonia and nitrate contents were determined. The ammonia amount was negligible. However, an accumulation of nitrates was observed in the non-fertilized sample, while in the fertilized one an N-blockade was observed which lasted longest in the raw material and shortest in the heated material. The experimental data are shown in detailed diagrams and tables. (Text-German)

67-0460

Hall, J. S. Pulverizing at Woking U.D.C. Public Cleansing, 57(9):510-511, 1967.

Since the only available site for dumping refuse within the Urban District of Woking was a 15-acre site of 6 ft depth, which would only permit the dumping of pulverized material, it was decided to install a Vickers II Seerdrum plant. The plant consists of two cylindrical drums 8 ft in diameter and 29 ft long. The refuse is loaded into a hopper approximately 6 ft 6 in. wide at the end of the drum; special deflection plates inside the drum retard the flow and assist the breakdown of material. The continuous loading forces the material against the plates, thus breaking it down as the refuse progresses along the first 12 ft of the drum. Water, which is essential to the pulverization process, is added at a point immediately behind the loading point. Each drum is rotated by two 35-hp slip-ring motors, and the flow of water can be regulated according to the speed of loading and type of product resulting. In the second half of the drum, the pulverized material is separated into an annular void and the rejects continue to flow to the end of the drum. Both are then discharged onto separate elevating conveyors running at right angles to the drums and discharged into trailers for transport to the dumping site. The complete units can be easily re-sited should a dumping area become available at a different location.

67-0461

Horizontal baler. Waste Trade World, 110(9):16, 1967.

The Personer LT12A horizontal hydraulic waste paper baling press, which produces bales measuring 33 by 28 by 35 in., weighing from 440 to 660 lb, is briefly described. Powered by a double-acting hydraulic ram, the press plate is guided against the press chamber interior by means of rollers, while the operating mechanism is located at the rear of the machine to provide access for maintenance purposes and to leave the front clear of obstruction. The press chamber is constructed of steel sections, and the material is loaded through two doors from above. The bale is secured by wires or straps passed through specially designed grooves in the press chamber, the end door, the sides, and the bottom of the chamber. The completed bale is ejected automatically. The machine can be supplied mounted on two moveable and two fixed ball-bearing type rubber tired casters to permit easy movement to the site of the waste material.

67-0462

How do you dispose of discarded drums? American City, 82(7):23, 1967.

Two hundred discarded drums a week from a local chemical company threatened the life of the sanitary fill site of the town of Bethel, Connecticut. After attempting several methods of crushing them without success, a 4-in-1 bucket mounted on an Allis-Chalmers HD-7G tractor solved the problem. The clam action of the multipurpose bucket picks up the container and with a flick of the lever, closes the clam to crush the drum. Once crimped, the drum is easily flattened by the track.

67-0463

Hydraulic paper baler. Waste Trade World, 111(19):14, 1967.

An improved, semi-automatic, and continuous hydraulic horizontal baling press for processing waste paper and cardboard, manufactured by Kempson Machinery Ltd., Magnet Works, is described. It is available in 10 standard capacities and bale sizes up to 36 by 40 in. The vertical baling press and box, tailored to suit customer's specifications, is powered by a hydraulic power unit or compressed air. All the boxes are interchangeable and can be manually controlled on self-aligning swivel casters. The material is fed into the hopper and when the correct level is reached for obtaining the required bale tightness, the sequence beam is cut off, which then operates the ram press and activates the hopper and rubber dividing boards or pins. These boards or pins control the length of the bale. Depending on the density and size of the material, the machine can produce over 3 tons per hr.

67-0464

Marriott, J. Wetherby breaks new ground in refuse/sludge treatment. Public Cleansing, 57(10):540-548, 1967.

A new treatment plant, incorporating the first Buhler pulverization plant in Britain, was officially opened on July 18. The plant, which will employ two men, was designed after seeking a satisfactory economic solution whereby the raw refuse and sludge arising from the population of Wetherby Rural District Council could be effectively treated on a joint basis to produce a satisfactory medium suitable as a tipping material. Throughput is designed for 40 to 45 cu yd refuse per hr with an average density of 6 cu yd per ton and a throughput cycle of 3.5 minutes. Site of the plant, site clearance, refuse yield per working day, and sewerage statistics are discussed. General layout is described and mapped, and the specifications for the working units of the plant are given. Running cost is unkown but is dependent upon electricity costs and hammer wear. Installation cost totals £132,889. Estimated net cost of treatment is £1 9s 6d per ton.

67-0465

New hammermill for refuse eliminates pre-sorting. Public Cleansing, 57(7):384-385, 1967.

British Jeffrey-Diamond Ltd. of Wakefield, is introducing a new range of crude refuse hammermills, which effectively combine the advantages of the conventional hammermill and the rotary screen type pulverizer, and have the ability to handle bulky refuse and trade waste economically, without any pre-sorting. The C.R. Crusher is basically a heavy-duty swing hammermill incorporating specially designed hammers, each weighing over 1 cwt, which introduces an exceptionally high degree of shear. This effectively reduces to an absolute minimum reduction by attrition and thus, the relatively heavy wear and tear experienced on conventional versions. The feed openings range up to 48 by 90 in. which will accept most materials arising in municipal refuse. An installed horsepower of 200 to 300 is recommended to cover the instantaneous peaks arising from the reduction of very bulky items, and items such as refrigerators, stoves, etc. are crushed to fist size pieces which can be recovered automatically by simple magnetic separation as a Grade I metal scrap. Within the limits of power, the machines are capable of reducing normal town refuse to a nominal 3-in. product, suitable for dumping, at the rate of 30 to 50 tons per hr. In addition, major capital cost savings in plant result from a single reception hopper and flowline for treatment of all materials.

67-0466

New mobile compaction system for bulky waste. Public Cleansing, 57(4):197-199, 1967.

The Rolonoff container handling system has a self-contained compaction gear to deal with high-volume low-density waste material. The power is supplied by a portable electrically operated power pack. Compaction is achieved by means of a 20-ton packing plate operated by a ram in the base of the unit. The ram works in tension, i.e. the plate is drawn in to compact the waste with a compaction ratio of 3 to 1. The compaction containers come in three sizes: 28 cu yd 16 ft; 35 cu yd 18 ft; and 40 cu yd 20 ft. The pack comprises electric motor, hydraulic pump, solenoid-operated control valves, relief valves, pressure switches, etc. Discharge of the compacted load is by tipping.

67-0467

New refuse compaction and removal system demonstrated. Public Cleansing, 57(6): 307-308, 1967.

A preview demonstration of a new system of bulk refuse handling was held at Salford's Wallness Cleansing Depot. The 'Wastepaktor' featured by Simon Compactors Ltd., has three basic units--compactor, container, and transporter. It is claimed that for domestic refuse a compaction rate of up to 3 to 1 is obtained. In some cases, the rate is as high as 4 to 1. A 31 cu yd container can have a load of 90 cu yd. With a density of 2-1/2 cwts per cu yd this would give a load of 11-1/4 tons, which would approximate the maximum permissible pay load. This system is ideal for those departments faced with long hauls or storage and disposal problems.

67-0468

Northern Ireland's pulverization plant. Refuse Removal Journal, 10(10):10, 1967.

The operation and design of a pulverizing plant, with a capacity of 40 tons of refuse daily, is described. It was built by Britains's Gondard Co. and installed at a Portadown, Northern Ireland, refuse dump. The end product from the unit is being used to cover the existing fill and landscape the area for future development. The County of Grimsby accepted a plan to erect a plant incorporating two Gondard pulverizers to handle 130 tons of refuse daily, with the capacity to handle a 50 percent increase in volume. One grinder will have a grill to produce material fine enough to use for topsoil. The design pays particular attention to avoiding common nuisances such as noise, dust, and smoke, and the plan includes the use of fully grown trees to form a screen on the side of the plant adjacent to the highway. The end product of this plant, which is expected to be in operation in 2 years, will also be used for fill.

67-0469

Open-type hydraulic baler. Waste Trade World, 110(10):14, 1967.

The Hindle open-type hydraulic baling press has two center channels with the hydraulic cylinders mounted next to them. Table travel may be either upward or downward with limit switches positioned to stop the table automatically at top or bottom limits. All hydraulic equipment is mounted on the top frame together with the electric motor. In both up and downstroke machines a mushroom head emergency stop button is provided. Power requirements are at a minimum during normal running, and when a required full load pressure has been reached the motor cuts out--full pressure being maintained while bale wrapping is carried out. Table sizes, pressures, and lighting can be varied to suit individual requirements. Prices range from £1,850 (15 tons) to £2,500 (90 tons). Full details may be obtained from Scrap Engineering Ltd., Blackburn, Lancs.

67-0470

Patrick, P. K. Waste volume reduction by pulverization, crushing and shearing. Public Cleansing, 57(9):489-496, 1967.

Since dumping sites are becoming very scarce, pretreatment of refuse for ultimate disposal will become essential. The various machines and processes used for size reduction are reviewed. The two main groups are pulverization, and bulky waste reduction. Pulverizers can be classified as drum type machines or hammermills. The advantages and disadvantages of these machines are discussed, and plant design for the elimination of manual sorting is particularly stressed. Refuse disposal plants should be designed as complete processing facilities, with mechanical, electrical, and magnetic safeguards to regulate the feed to the pulverizer, which itself should be robust enough to deal with occasional difficult items. The cost of pulverizing in the simplest plant is likely to be at least 12s 6d per ton and, depending on buildings and refinements, could be very much higher. Bulky waste could also be reduced in volume by impact crushers or hydraulic shears. Both types of machines have been used on the continent for this purpose and are described in the original paper.

67-0471

Pulverization continues to spread in Great Britain. Refuse Removal Journal, 10(2):36, 1967.

Bulk reduction in Great Britain is with: direct incineration, 80 to 85 percent; screening, salvaging and incineration, 70 to 75 percent; screening, salvage and pulverization, 55 to 60 percent; pulverization, only 30 to 35 percent; and screening, salvage and composting, 15 to 20 percent. Pulverization improves landfills for these reasons: bulk reduced 33 to 40 percent; landfill covering not necessary; rodents not attracted; and fly nuisance reduced. Pulverization creates a compact mass of the waste.

67-0472

Pulverization facility has capacity of 15 tons an hour. Refuse Removal Journal, 10(7):33, 1967.

Pulverization plants have been recently installed at Horley and Portsmouth, England. The Horley installation was built at a cost of $70,000, including $53,200 for the pulverizer and feed systems. Refuse is pulverized without sorting and there are very few rejects (about 0.5%). Pulverized material is then conveyed to a bulk-transport vehicle. Cost of operation is unknown, but the makers of the system, Tollemache Composting Systems, Ltd., state that the cost of hammer wear is less than 14 cents per ton pulverized, and depends on the adjustment of the grind. Electric power is another cost. The second installation, a semi-mobile plant at Portsmouth, consists of a Tollemache ballistic separator pulverizer, an apron plate-feeder and an output conveyor. Driven by a 165 hp diesel engine, it costs $51,800 to install, has a capacity of 15 tons per hr, and could be moved to another site within 3 days.

67-0473

Reinhardt, J. J., and W. K. Porter. A pilot plant investigation of milling refuse for landfill disposal. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. B-9.

A planned demonstration project to determine the feasibility of using the Heil-Gondard refuse milling system, now in use in Europe and Montreal, Canada, is outlined. The system centers around the French developed Heil-Gondard ballistic rejection hammermill which is similar to others except that the hammers rotate with the direction of feed, and a ballistic reject tower is mounted over the hammers. The main parts of the pilot system are described. It is designed to mill 56 tons during a 7-hr shift. Objectives of the project are: to evaluate the economics of the system;

operational problems; salvage operation; and effects of different mesh sizes; to compare sanitary characteristics of milled and unmilled refuse; to evaluate the milled refuse in a landfill; to compare landfills using milled and unmilled refuse; and to investigate garbage, rubbish and combined refuse in Madison, Wisconsin, with respect to the objectives mentioned above.

67-0474

Stationary waste packer. Modern Maintenance Management, 19(2):34, 1967.

A hydraulic stationary packer can compress cans, bottles, metal turnings, wood and paper with a volume reduction of 10 to 1. Haul-away costs are reduced proportionally.

67-0475

Waste crushing. Staedtehygiene, 18(12):IV, 1967.

Buettner-Werke AG in Krefeld-Uerdingen, Germany, has developed a crusher for domestic waste. The crushed waste can be composted either in beds or rotting towers or can be incinerated. For bulky waste a large crusher has been developed which reduces refrigerators, sofas, cabinets, etc. to pieces that are approximately 10 to 20 cm in size. Both crushers are durable and do not require many repairs. (Text-German)

67-0476

Will bale rubbish for ocean burial. Refuse Removal Journal, 10(9):84, 1967.

U.S. Patent 3,330,088 has been granted for a method of compacting and baling trash so it will sink. The raw refuse is compressed in weighed quantities--from 500 pounds to a ton--into bundles with a density greater than that of water. The outside is coated with asphalt or strapped with metal or plastic. The scheme includes several optional steps, depending on the nature of the material. Trash may be ground up and mixed with adhesives before baling. If the density is marginal, the surfaces may also be punctured before dumping.

INCINERATION

67-0477

Solid Wastes Program. Report on the municipal solid wastes incinerator system of the District of Columbia. Cincinnati, U.S. Public Health Service, June 1967. 77 p.

In response to a request by Senator Tydings of Maryland, the Public Health Service's Solid Wastes Program conducted a study of the District of Columbia's municipal incinerator system. Conditions and operating characteristics were defined as those factors that reflect materials handling, personnel utilization, use of equipment, and impact upon the surrounding neighborhood. Indices of incinerator efficiency were defined as those factors reflected by charging rate, loading rate, level of furnace temperatures, quality of residue, percentage of weight reduction, and quality of stack emission and quenching waters. Past records were examined in order to compare current quantities of solid wastes entering the system. At present the incineration system is burning approximately 65 to 70 percent of what it actually can burn in 24 hr. Plumes emanating from all four incinerators were seldom visible. Temperatures in the furnaces seldom reached the level considered acceptable for satisfactory combustion. Most of the furnace controls at each incinerator were inoperative. Low scores and unsatisfactory ratings were received by all four incinerators primarily because of the inability of the facilities to be scored on such ‘must’ items as residue quality, instrumentation, and controls. The fact that the system is handling less wastes each year while requiring an increasing number of man-hours to incinerate this reduced load is attributed to long-term neglect of the facilities, lack of planned preventive maintenance programs, and failure to utilize the facilities as designed. It is recommended that each incinerator be placed in optimum operating condition, that a maintenance and preventive program be developed, and that air pollution control equipment be installed. Complete redesign and rebuilding of two facilities should be considered.

67-0478

Adopts statewide air-pollution rules. Refuse Removal Journal, 10(1):36, 1967.

During periods when potential is high for air pollution, all open burning of refuse will be prohibited in New York State.

67-0479

Aerospace Commercial Corporation. CPU-400 Technical description and economics study. Palo Alto, Calif., Sept. 1967.

To reduce the cost of incineration, Aerospace Commercial has applied advanced technology to the design of a system which consumes refuse and produces electric power. The CPU-400, with a 400 tons per day capacity of refuse, provides 17,200 kw of electric power. The first phase of the CPU-400 development's preliminary design study is funded by the Department of Health, Education, and Welfare. Some of the advantages of the system are: high capacity, high efficiency, compliance with air pollution standards, a reasonable return on invested capital, compactness, economical operation, and a reduction in the collection and disposal costs of refuse. Other areas covered are: technical description, economics, a summary, and two appendices. Supporting data and illustrations are furnished as well as estimated cost breakdowns of the main system and subsystems.

67-0480

Aerospace Commercial Corporation. Economics. In CPU-400 Technical description and economics study. Palo Alto, Calif., Sept. 1967.

The CPU-400 can produce electric power in the range of 1.7 to 4.5 million kwh, and the power would be utilized efficiently in the overall distribution system. Other benefits would be lower disposal and hauling costs which comprise a large portion of total refuse collection and disposal expenses. Development costs, capital costs, operating costs, maintenance costs, disposal costs, and a return on invested capital have been estimated and are presented. Capital cost of the plant is estimated to be at 3.4 million. The system will generate about 25 percent more electric power than the conventional steam generator for each ton of refuse, and is only a fraction of the size of present steam incinerators. Although the cost studies are by no means comprehensive at this early date, they do indicate that generating electricity from refuse with steam boilers may not be economically practical although it may appear attractive at first glance. The studies show that the CPU-400 has a marked advantage over steam incinerators.

67-0481

Aerospace Commercial Corporation. Technical description. In CPU-400 Technical description and economics study. Palo Alto, Calif., Sept. 1967.

The CPU-400 is unique in that it burns refuse at 7 to 12 times atmospheric pressure, using a gas turbine to supply high pressure air for the combustion of refuse and to generate electric power, whereas conventional incinerators burn refuse at atmospheric pressure. The system requirements are enumerated and presented. The system is described and illustrated. Using a rotary storage pit, with a 24 hr capacity, refuse is fed tangentially to one of two redundant shredders, then to the combustion feeder by compressed air. The combustor (170 psi) utilizes drum grates. Inertial and electrostatic separators are used in tandem at the base, through which large and small particles are passed prior to the introduction of the hot gases into the gas turbine. The CPU-400 system has been divided into six subsystems. A description of each is furnished. A fluidized sand bed will be investigated. The ash and residue produced has many potential uses, which will be explored in detail. The reduced construction cost, reduced land costs, and the steam produced with the waste heat recovery equipment are its main advantages.

67-0482

Amid Brisbane controversy 2000-ton-a-day facility proposed. Refuse Removal Journal, 10(11):8, 1967.

In the face of continued doubt whether the Sierra Point landfill site will be operative, Sanitary Fill Company, Golden Gate Disposal Company, Sunset Scavenger Company, and Pacific Gas and Electric Company have announced a plan to construct an incinerator. Cost is about $12 or $13 million, but the Bank of America in California has expressed a willingness to finance, contingent upon a 20-year contract between the city and the incinerator. Sierra Point, which is a 105-acre site owned and operated by Sanitary Fill Company, was designed to handle 1,500 tons of refuse daily from the city of San Francisco for a minimum of 6 years. The site, however, is located in the town of Brisbane, and citizen groups have been opposed to the presence of the landfill. Sanitary Fill has fought all the way to the State District Court of Appeals in San Francisco. The location of the proposed incineration site is also in doubt. The favored site by the contractors is in an area already marked for redevelopment, but there is no assurance that the Redevelopment Agency will approve the presence of an incinerator. Furthermore, there is no assurance that Brisbane will not forbid landfill operations before the incinerator can be built, a minimum of 3 years. In the meantime, however, a special advisory election on October 17, 1967, by Brisbane voters, favored by 591 to 535 the acceptance of a new 5-year landfill contract with Sanitary Fill Company.

67-0483

Apartment building owners operate burners, despite law. Refuse Removal Journal, 10(11):37, 1967.

In 1966, New York City adopted a stiff law on air pollution which established new burning and scrubber standards for incinerators in apartment buildings, and decreed that units which did not meet the requirement must be upgraded by May 20, 1967, or close down. A dispute which is now raging centers upon the different estimates of refuse increase which might result from a shut-down of many of the city's apartment-house incinerators. As more than 75 percent of the incinerators were installed before 1950, perhaps one-third will have to be closed because updating them would be impractical. The Sanitation Commissioner, using the figure of 2.5 lb refuse per apartment dweller per day, has estimated about 1,100 tons of refuse would be added to the daily collection load of 11,000 tons. Some councilmen dispute his estimate, contending that 4.5 lb per day per apartment dweller is a more realistic figure. The price of upgrading incinerators varies from $5,000 to $10,000, depending on size. Special tax subsidies and deductions have been suggested.

67-0484

Ask Kansas City stop open burning. Refuse Removal Journal, 10(6):32, 1967.

Refuse burning except in controlled, multi-chambered incinerators should be prohibited in Kansas City after August 1, 1967.

67-0485

Barton, A. E., and E. J. Ostle. Tests on emission from refuse incineration stacks. Smokeless Air, 37(141):159-160, 1967.

The growing extent of municipal refuse incineration coupled with the trend toward greater paper content in refuse necessitates stricter compliance with the Clean Air Act. Even more expansion in refuse incineration is predicted due to depletion of tipping and growth of the packing industry. This calls for extensive planning schemes where local authorities would pool their resources to cover developmental work on gas cleaning plants, the nature and effect of changing refuse emission pollutants, and new incinerator fuels. Data are included on tests of constituents surveyed and contents of house refuse.

67-0486

Baton Rouge plans a ram fed burner with 97% consumption. Refuse Removal Journal, 10(9):86, 1967.

The East Baton Rouge, Louisiana, City-Parish Solid Waste Disposal Committee recently outlined its final plans for a ram fed incinerator designed to accomplish a 95 percent burnout. The plant, with its two furnaces, will handle 600 tons of waste a day, operating on a 12-hr basis. Longer operation can increase its capacity up to 700 tons. The plant will be odorless since it will be completely enclosed. It will have a small, 45-ft stack, but no smoke will be emitted from it. Two processes will be used to eliminate ashes from the stack area and to condense the smoke-like vapor coming from such plants.

The incinerator can be operated by as few as five men and controlled by only one man. One new feature will be aerated grind tanks that will take the sanitary sewer plant effluent, clean it up, and recirculate it to the incinerator; there, the effluent will be used to quench the hot material coming out of the furnaces. The process uses about 3,600 gal of water a minute. Another feature is magnetic conveyor belts to separate burned tin cans and fused glass. Cost of the plant is estimated at $2.6 million, but this figure would be increased to about $4.3 million by the inclusion of several innovations.

67-0487

Bishop, J. W., and L. F. Deming. Economics of solid waste incineration. In Proceedings; MECAR Symposium, Incineration of Solid Wastes, New York, Mar. 21, 1967. Metropolitan Engineers Council on Air Resources. p.51-59.

The first water-cooled furnace wall incinerator-boiler in the United States is being put into service at the Norfolk Naval Base as a result of a study of relative economics between this type of installation and a refractory furnace incinerator. Some alternatives to incineration which should be evaluated are: composting with sale of by-products, reclamation of land by sanitary landfill, and ocean dumping or open burning with controlled overfire air. The following economic factors will be reflected in the future incineration of refuse: sizing of new plants for 24-hr-per-day operation at least 6 days per week; new design concepts to minimize initial cost, maintenance and staffing; utilization of waste heat; and industrial built and operated incinerator plants which dispose of community refuse and utilize the by-product energy. In order to describe typical procedures for making an economic evaluation of disposal systems, the actual comparison figures for a 160-tons-per-day refuse disposal facility are tabulated. New concepts of incineration, which may provide better methods for the thermal destruction of refuse, are use of a fluidized bed, and high temperature combustion of combustibles along with fusing of non-combustibles into slag.

67-0488

Bohne, H. Air pollution damage from hospital incinerators. Staub, 27(10):451-453, 1967.

The strong discoloration, whitening, and eventual death of plants in two garden nurseries in the vicinity of hospital incinerators was shown to be caused by hydrogen chloride from the hospital refuse incineration plants. Chlorine compounds in the refuse, consisting of 80 to 90 percent paper and packaging material, were decomposed during short periods at a temperature of 800 to 1,000 C. Tabulated data show that the dust produced during the incineration is considerably higher in the flue and chimney than immediately after cyclone purification. Tables also provide information on the hydrochloric acid, the hydrofluoric acid and the sulfur dioxide content of the exhaust gas as well as the chlorine content of various packing materials. During incineration above 900 C, most of the chlorine was given off, with the 900 C preheated oven taking only 30 to 40 seconds. Erection of a chlorine washing plant attached to the incinerator is recommended. (Text-German)

67-0489

Burge, S. J., and C. F. Tipper. The burning of polythene. Chemistry and Industry, (9):362-363, 1967.

The chemistry of the burning process of polyethylene was examined to determine the temperatures produced and the gases given off. The experiment was done on a 1 in. diameter rod of grade A polyethylene. Tentatively, the combustion process was as follows: Heat combustion from an applied flame melts the polymer and as the temperature at the surface of the melt increases, degradation begins giving lower alkanes and alkenes. At the surface of the liquid, rapid oxidation (which gives CO, carbon dioxide, and water) and oxidative degradation occur, further combustion giving the actual flame. In the blue region of the flame, the reactions occur slowly and the temperature rises slowly to about 700 C. At this temperature the hydrocarbons are consumed, giving off mainly carbon.

67-0490

Chicago plans two incinerators. Refuse Removal Journal, 10(2):32, 1967.

Chicago is building two new incinerators. The first will be a 1,200-ton-a-day facility, and planning envisions a combination of a wet scrubber and an electrostatic precipitator to cut down air pollutants. Chicago plans to build a grinding station for the experimental sizing of refuse and reduction of combustible bulk material. Dust from the pit area is reduced by water sprays. Residue from the plant is removed in enclosed bath-type drag link conveyors which reduce dust.

67-0491

Claim semi-mobile incinerator will burn autos, timber, bulk. Refuse Removal Journal, 10(9):18, 1967.

The Perfectaire Incinerator can be moved over a pile of rubbish that has been placed on the ground or in a trench; it then lowers its end doors and ignites the refuse. The smoke thus generated is channelled through the after-burner, passing through flames of oil or gas burners. Thus the smoke is consumed and remaining carbon particles are ignited when they impinge upon the incandescent stainless steel flue passages. If combustion is complete or the resulting emission falls within the prescribed tolerance levels, the gases are passed through a wire mesh screen to trap any remaining flyash. Otherwise, a centrifugal blower recycles the smoke until anti-pollution levels are reached. The after-burner may be fitted with a washer-scrubber instead of fuel burners, which is a most valuable substitution in fire hazard areas or where odor control is important.

67-0492

Combustible rubbish content favors using heat recovery. Refuse Removal Journal, 10(11):32, 1967.

According to C. A. Rogus, refuse incinerators in America should incorporate equipment to use the heat for the production of electricity. Heat energy from American refuse is about 3,500 to 5,000 Btu. Efficient burning can be achieved through improved furnace design, and more efficient exploitation of the heat can be obtained by the use of water-cooled walls, reducing the size and cost of separate boiler construction. Incorporation of steam-electric generators may increase plant cost by about 25 percent, but the sale of electricity would partially offset the operating costs. Most incinerators built in Europe since World War II incorporate power generating equipment, but the heat from 45 percent of the refuse burning plants in America is usually wasted.

67-0493

Conrad Engineers. Incinerators. In Tenement refuse disposal systems and artificial illumination of communal areas. Los Angeles, Mar. 1967. p.21-26. (Distributed by National Technical Information Service, Springfield, Va., as Publication No. PB 180 879.)

The City of New York studied the problem of existing units in single dwellings and apartment buildings and has developed criteria which will achieve incinerator performance meeting the requirements of local law. The incorporation of incinerators into rehabilitated tenement buildings as a convenient method of refuse disposal is feasible if they are designed to meet the need. Such design would take into account the anticipated rate of loading, burning cycles, operating temperatures, dust collection, and associated controls. The use of auxiliary burners is mandatory and an operator is required, at least part-time, to assure that proper conditions are maintained. The high cost of inserting a chute and flue into an existing structure, and the space requirement of the incinerator itself, may be too much to support in a single building. When tenement building rehabilitation is undertaken on a large scale, it may be a better solution to install in each building a refuse collection system such as chute and packer, or chute and rolling cart, and then provide an incinerator within each square block of buildings. This concept would justify the cost of installation of a larger unit whose initial cost per dwelling unit would be less than the total cost of individual units.

67-0494
Continuous incineration. Machinery Market, 1967(3467):43; 49, 1967.

The new Heenan-Nichols continuous incinerator, which burns domestic refuse as it is received, is described. The most important part of the incinerator is the grate which is constructed in three sloping banks and divided into two sections. Each section is made up of horizontal rows of moving cast teeth which agitate and propel the burning refuse progressively down the slopes by hydraulic power. A substantial savings in labor involving lower maintenance costs, no presorting or screening, long-life grate teeth, and full or partial automation are claimed. After 2 years of construction, research, and development, the demonstration unit has been working satisfactorily for some months. Although the plant was designed to deal with 6 tons of refuse per hr, it now burns 7 to 8 tons per hr.

67-0495
Danielson, J. A. Air pollution engineering manual. Public Health Service Publication No. 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967. 892 p.

This manual deals with the control of air pollution at the source, emphasizing the practical engineering problems of design and operation. Individual chapters present: a history of air pollution in Los Angeles County; types of air contaminants; design of air pollution control devices including local exhaust systems and equipment for particulate matter, gases and vapors; and control of air pollution from metallurgical, mechanical, incineration, combustion, petroleum, and chemical process sources. Appendices topics are: rules and regulations of the air pollution control district; odor-testing techniques such as the odor panel, the evaluation room, the sampling and determination of odor concentration; hypothetical available heats from natural gas; and miscellaneous data including threshhold limit values, physical properties of air, fuel oil and solids, charts showing size and characteristics of airborne solids.

67-0496
Dey, H., J. Mahoney, J. D'Imperio, et al. Air pollution control equipment for particulate matter. In Air pollution engineering manual. Public Health Service Publication No. 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967. p.171-232.

Inertial separators, wet collection devices, baghouses, single-stage and two-stage electrical precipitators, settling chambers, impingement separators, panel filters, and precleaners are used in control of particulates such as smoke, dusts, fumes, mists, and sprays. Single-cyclone and other cyclone separators are inertial separators without moving parts, used widely for removal of medium- and course-sized particulates. The theory of operation, separation efficiency, and a method of pressure drop determination are discussed. Types of wet collection devices are spray chambers, cyclone-type scrubbers, orifice-type scrubbers, mechanical scrubbers, centrifugal collectors with water sprays, high pressure sprays, venturi scrubbers, packed towers and wet filters. Baghouses remove suspended dust and fumes with filters, using the mechanisms of direct interception, impingement, diffusion, and electrostatics. Filter resistance coefficients for industrial dusts on cloth-type air filters and the cloth resistance factor for specific applications are given in tables. The characteristics of filter cloths depend upon the fiber, yarn, weave, finish, size, and shape. Installation and cleaning of filters, disposal of collected dust, baghouse construction and maintenance are additional topics. The history, application, advantages, and disadvantages of a single-stage electrical precipitator are examined. Operating voltage and sparking rate influence collection efficiency. Costs for precipitators depend upon the size, type of dust or fume, and efficiency required. Important design factors are mentioned. The theoretical aspects, design factors, construction and operation, and application of two-stage precipitators are presented.

67-0497

Don't sell incinerators short. American City, 82(3):8, 1967.

Incinerators have become very unpopular because designing engineers have never paid enough attention to those factors that would make them nuisance-free, and local governments that operated them have neglected them and permitted them to become overloaded. Recommendations to make incinerators more attractive to the community include: (1) installation of a good flyash removal system; (2) incinerators should not be allowed to receive more refuse than their rated capacity in any one day; (3) the condition of the stack gases should be continuously monitored and recorded; (4) incinerators should not be excessively large because the larger they are, the greater the truck traffic and the stigmatization of the neighborhood as a dumping ground.

67-0498

$11 million plant to treat raw refuse. Refuse Removal Journal, 10(4):42, 1967.

An $11 million incinerator was proposed to be located at Croton Point where raw refuse is now dumped. It will serve 11 Westchester County, New York towns.

67-0499

The first scrubber in New York City. American City, 82(12):59, 1967.

Chemical Construction Corp. of New York will install New York City's first scrubber in its 73rd Street incinerator at a cost of $293,000. The control device, which is a flaring, tubular-shaped unit, is designed to virtually eliminate flyash and particulate matter, and substantially reduce odorous emission of gases in the No. 1 furnace (capacity: 220 tons per day). Gases and particulates from the furnace will travel into the Venturi tube, gaining velocity as they pass through its narrow throat. There, they will be sprayed with droplets of water and subjected to centrifugal action. As the particulates become wet and heavy, they will combine and drop to the bottom. The scrubbed gases will discharge from the stack, and the dust, soot, and fly ash will be hauled to a landfill.

67-0500

Fox, R. A., ed. Proceedings; MECAR Symposium, Incineration of Solid Wastes, New York, Mar. 21, 1967. Metropolitan Engineers Council on Air Resources. 81 p.

The symposium was sponsored by the Incinerator Committee of the ASME Process Industries Division and the New York sections of the AECHE, AIME, ASCE, ASHRAE, ASME, and ASTM. The topics covered were: composition and combustion of refuse; economics of solid-waste incineration; burning industrial wastes; and air pollution control equipment for incinerators. The refuse-fired steam generator at the Navy Base in Norfolk, Virginia; a new incinerator at Munich, West Germany; and an incinerator with refractory furnaces were described in detail.

67-0501

From modest operation to three incinerators...contractor serves Cincinnati. Refuse Removal Journal, 10(4):30-31, 1967.

Each of Tom Clark's incinerators in Cincinnati, Ohio, has been designed to meet a particular need. The 6-year-old 300 ton traveling grate unit burns mixed residential and commercial material. A new 150-ton twin incinerator handles only industrial refuse, such as paper, cardboard, kindling-type wood, excelsior, oil paper, etc. Both incinerators have spray and baffle systems to cut air pollution and fly ash. The third facility, a 150-ton conical burner, is used exclusively for heavy demolition type lumber, boxes, skids and other wood from industry. As a result of this strict segregation, each operation obtains an extremely high burn-out. In fact, Clark hardly considers residue a problem and does not bury it on landfill. Some is used on access drives and the rest is given away. Metal strapping and old corrugated paperboard are salvaged and baled.

67-0502

Fryling, G. R. Combustion engineering; a reference book on fuel burning and steam generation. New York, Combustion Engineering, Inc., 1967.

Methods and equipment used for fuel burning, steam generation, and heat recovery are covered. Chapters on flash drying systems and refuse incinerators are included. Appendices present combustion calculation charts and a discussion of the properties of steam. A name and subject index complete the volume.

67-0503

Fryling, G. R. Refuse incinerators. In Combustion engineering; a reference book on fuel burning and steam generation. New York, Combustion Engineering, Inc., 1967.

Principles and data for designing refuse incinerators are presented. Tables of various types of refuse components and their Btu as fired are given as well as curves for combustion calculation. A sample calculation of major design factors is developed for a typical incinerator with a 100-ton-per-day capacity. This method of selection and sizing of furnaces, flues, dust collectors, fans and stacks refers all incinerators to the common denominator of heat input. Curves showing furnace temperature with various excess air and moisture contents are presented. Heat utilization from municipal and industrial incinerators is examined. Operation of an industrial incinerator with an 80-ton-per-day load is described. Waterwall construction and high temperature water boilers for incinerators are briefly evaluated. Other topics briefly reviewed are refuse handling and incinerator combustion control.

67-0504

Grapple replaces clam bucket in incinerator remodeling. American City, 82(4):45, 1967.

A 6-tined grapple on a bridge crane is picking refuse out of the storage bin in a 30-year old incinerator in Rochester, New York. The incineration plant operates around the clock, but receives refuse from 6 AM to 4 PM.

67-0505

Gerstle, R. W., and D. A. Kemnitz. Atmospheric emissions from open burning. Journal of the Air Pollution Control Association, 17(5):324-327, 1967.

Emission data are given of the results of simulated open burning of municipal refuse, landscape refuse, and automobile components which was conducted to provide missing information on the emissions from the common practice of open burning. A sketch is given of the burning tower, consisting of a cone 20 ft high, 16 ft in circumference tapering to a stack 29 1/2 in. in diameter, 8 ft high, and suspended 4 ft over an 8 ft in diameter burning and weighing table. The sampling port is located 4 ft from the top of the stack. A schematic sketch is given of the sampling train for the particulate and polynuclear hydrocarbon train. Charts are given which show the variations of the carbon dioxide, CO, and hydrocarbons with time during the burning of municipal refuse, landscape refuse, and auto components. Charts are shown which give the gaseous emissions in lb per ton of refuse originally present. A chart is given which shows the nitrogen oxide emissions in ppm, lb per ton of material burned at various times during the burning. Charts are given of the particulate and polynuclear emissions. Atmospheric emissions from open burning are characterized by high emission of products of incomplete combustion. Municipal refuse gave 85 lb per ton, landscape refuse 65 lb per ton, and auto components 125 lb of CO per ton. The gaseous hydrocarbons paralleled the CO and averaged 30 lb per ton. Polynuclear hydrocarbon emissions were high. The disposal of refuse by open, uncontrolled burning leads to higher particulate emissions and creates an unnecessary air pollution problem.

67-0506

Haberman, J. New York City will train thousands of fuel burner, incinerator operators. Power, 111(12):92-93, 1967.

New York City's new air pollution bill, Local Law No. 14, stipulates both the upgrading of incinerator and fuel-burning equipment and the training of people in the proper handling of the equipment. The selection of instructors, setting up of courses, and preparation of practical examinations, all of which have been completed, are described. Classes will start in early 1968, will be held one night a week for 2 hr and will run for a total of 7 weeks. As many as 30,000 operators may be trained.

67-0507

Harris, S. M. Incineration in multiple hearth furnaces. Water and Sewage Works, 114(8):307-312, 1967.

Suburban growth, land availability, haulage costs, and the scarcity of skilled and semi-skilled labor are increasing the problems of sludge digestion. The incineration of sewage and industrial waste sludges in multiple hearth furnaces after dewatering of the sludges was studied. The multiple hearth furnace used was originally developed by Herreshoff for roasting pyrites, but now has been adapted for drying and/or burning sewage sludges, grit, grease, screenings, and industrial wastes. The multiple hearth furnace is a cylindrical, refractory-lined steel shell with a series of horizontal refractory hearths located one above the other. These hearths have an alternate in-feed and out-feed direction actuated by rabble arm teeth which plow the material across the hearths to the peripheral or central openings through which it drops to the hearth beneath. There is a true countercurrent flow of the wet sludge cake and the hot gasses of combustion. Although there is no odor problem, the exhaust gasses are scrubbed before discharge. The anticipated costs of incineration decrease with the size of the installation. For a plant capacity of 0.93 tons per day with a furnace diameter of 10 ft 5 in. and 5 hearths, the cost per ton was $9.25, while for a 13.88-ton-per-day plant with an 13-ft-9-in. diamater furnace and seven hearths, the cost is $2.75 a ton. It is anticipated that, with improvement in the dewatering of the sludges, incineration will tend to become the standard method of disposal of troublesome sewage and industrial waste sludges.

67-0508

Heat recovery makes garbage less a burden. Chemical Engineering, 74(18):72, 74, 1967.

A naval base at Norfolk, Virginia, produces steam power for docked vessels by burning its garbage in two tightly sealed furnaces built without firebrick. Each can handle 180 tons per day of refuse, generating more than 50,000 lb per hr of saturated steam at 275 psi. Pacific Gas and Electric (PG&E), Sunset Scavenger Corporation, and Golden Gate Disposal Company in San Francisco, California, will jointly build a $10 million installation that can handle 1,900 tons per day of garbage next to a PG&E power plant if San Francisco grants a 20-year contract. A group of San Francisco businessmen inspected heat recovery incinerators in Germany; plants they saw there led them to recommend an electricity-from-wastes facility in San Francisco. Pictures of and data on the plants at Essen, Mannheim, Dusseldorf, and Leverkusen are included in the article.

67-0509

Hescheles, C. A. Burning industrial wastes. In Proceedings; MECAR Symposium, Incineration of Solid Wastes, New York, Mar. 21, 1967. Metropolitan Engineers Council on Air Resources. p.60-74.

Manufacturing plants are facing increasing problems and costs in connection with the disposal of waste materials generated during the normal course of producing saleable products. The four basic methods of burning solid wastes are in flow-through, rotary-hearth, rotary-kiln, and fluidized-bed furnaces. The selection of a facility to burn industrial wastes is based on actual daily waste production, the nature of the waste, and the quantity produced in various departments. Waste analysis should include the following chemical and physical characteristics: water content; volatile matter; fixed carbon; ash content; heating value; corrosiveness; toxicity; odor; explosiveness; ignition temperature; ash-fusion temperature; and density. The purpose of a test of a waste-burning installation is to determine the adequacy of design concept; whether the contractor is meeting design specifications; the operating efficiency; and air-water pollution compliance. Waste-heat energy available in industries has been utilized in the past only in certain industries, whereas the major portion has been neglected as a tremendous source of fuel available in industrial wastes. A new approach to the solution of burning a variety of wastes would be a central facility to burn all the wastes under the supervision of progressive waste management. A central facility would be responsible for solid wastes preparation, liquid waste preparation, and sludge handling. Industrial waste burning facilities with sludge flash drying and fluidized sludge combustion are illustrated.

67-0510

Hume, N. B. History of efforts at incineration in the Los Angeles area. Journal of the Air Pollution Control Association, 17(5):308-309, 1967.

The problems encountered in Los Angeles with incinerators which are considered typical of the Southern California area are reviewed along with the economics which led the city to depend on sanitary landfill rather than incineration for refuse disposal. A plan was developed in the middle 1940's to construct four incinerators in the metropolitan area to replace an old incinerator in Vernon which served the city. In 1954, after millions had been spent on incinerators and millions more were about to be committed, the Los Angeles Pollution Control District refused permits to all the municipal incinerators in the county, since none of them met the minimum pollution control requirements of 0.4 grains of particulate matter per cu ft. The total cost of operating the Gaffney St. plant in 1959 to 1960 was $5.57 a ton (including $1.20 for depreciation) for 30,480 tons per year. The San Fernando Road incinerator disposed of 83,311 tons per year at $3.60 per ton prior to its shutdown in 1960. It was concluded that sanitary landfill at a cost of $1.00 a ton would be more economical even with round trip hauls of 30 miles (cost 10¢ per mile per ton). The mountains and foothills which surround Los Angeles are responsible for the air pollution problem also provide excellent sanitary landfill sites. Unless the landfill costs increase greatly or landfill sites become depleted, incinerators will not be economical for the City of Los Angeles as a method of refuse disposal. Of the dozen municipal incinerators in operation in the greater Los Angeles area prior to 1960, only one is in regular operation now.

67-0511

Hummell, J. D. Build incinerator next to disposal site. Refuse Removal Journal, 10(1):20,30, 1967.

A facility to serve Piqua and Troy, Ohio, uses incinerators for disposal of combustible refuse and a landfill for incinerator residue and non-combustible materials. A study of quantities and type of refuse as projected to 1990 was conducted. Unanticipated industrial growth could generate unpredictable quantities of waste so the incinerator could be enlarged to handle twice the quantities predicted. Improvements are likely from the charging chutes on through the furnace to combustion gas and residue handling systems, and heat utilization. Consequently, the initial facility will have building space for an additional furnace with improved techniques. The refuse pit will serve as the storage area to permit continuous firing 24 hr per day. The 150-ton-per-day incinerator will be of the continuous flow type fed from a water cooled chute. Residue will be collected in a hopper to be hauled later to the landfill. Fly ash from the gas scrubber will be pumped with water to a settling pond. Advantage features to reduce operating labor include: voice communication system, automatic control of underfire air to provide a set rate of air flow, automatic control of overfire air to prevent odors, charging hopper side extensions to prevent spillage, provisions for using a crane to remove objects from the pit not to be charged into the furnace, and air-cooled side walls to prevent slag.

67-0512

Incinerator smoke scrubber. Journal of the Air Pollution Control Association, 17(5):342, 1967.

The new stainless steel scrubber, 'Turbulaire', not only helps New York comply with its new air pollution control regulation but is ideal during the water shortage.

67-0513

Kaiser, E. R. Composition and combustion of refuse. In Proceedings; MECAR Symposium, Incineration of Solid Wastes, New York, Mar. 21, 1967. Metropolitan Engineers Council on Air Resources. p.1-9.

Incineration of municipal refuse reduces the weight of refuse by 75 to 80 percent and the volume of land space required by 90 to 93 percent. To achieve over

98 percent completion of combustion is today's challenge. Three lots of ¾ to 1 ton each of refuse from the pits of the Oceanside (Long Island, N.Y.) Refuse Disposal Plant were sorted by components. Composition, moisture content, and proximate analyses (ASTM), ultimate analyses, heating values, and analyses of mixed domestic refuse are tabulated. Loose refuse has a bulk density of only 4 to 5 lb per cu ft. Refuse has poor flow characteristics. Its angle of repose varies from 45 degrees when loose to 90 degrees when compacted. With complete combustion, a ton of test refuse would be converted to the following products; 1,148 lb of water vapor; 1,360 lb of carbon dioxide gas; 9.4 lb of nitrogen gas; 1 lb of sulfur dioxide gas; and 438 lb of inert residue consisting of 185 lb of glass and ceramics, 145 lb of metal, and 108 lb of ash. The gaseous products of combustion are natural constituents of the atmosphere. The sulfur dioxide emission is low because of the low sulfur content of refuse and the conversion of most of the sulfur to sulfates by the alkaline ash. Because of the large tonnages available, the negative cost of refuse, the calorific values, and low sulfur dioxide emissions, refuse should be considered as a suitable fuel for power generation.

67-0514

Kaiser, E. R. Incinerators to meet new air pollution standards. Presented at Mid-Atlantic Section Meeting, Air Pollution Control Association, New York, Apr. 29, 1967. 9 p.

In the 1950's emissions of particulate matter from incinerators were controlled to 0.85 lb per 1000 lb of flue gas corrected to 50 percent air. At present, the federal agencies, the State of New York, Chicago, Los Angeles, Detroit, and other metropolitan areas require control in the range of 0.2 and 0.35 lb on the same or equivalent basis. Since particulate matter discharged with stack gases is expressed in several different ways, a comparison table equates them. Municipal incinerators operating at full rating may discharge flyash from the primary furnace equal to 2 percent of the refuse charged, or 40 lb per ton. Roughly half of the particulates are carbon. Collector efficiencies of 96 to 97 percent are required to produce clear stack gases from refractory-lined incinerators, while 98.5 percent efficiency is necessary for clear stacks from water-tubed incinerator furnaces. The basic principles for complete combustion of solid refuse and low dust emission include: an excess of combustion air of 50 to 200 percent above the stoichiometric minimum; maintaining gas temperatures in the furnace space between 1,400 and 1,800 F; providing time for burnout of flying particles and of gases by the use of ample furnace volume and by secondary combustion chambers. The average heat release rate per cubic foot of furnace volume should not exceed 25,000 Btu per hr. Gaseous contaminants produced by incinerators are: carbon monoxide; aldehydes; nitrogen oxides; organic acids, ammonia, esters, and hydrocarbons; and sulfur dioxide.

67-0515

Kalika, P. W. The effects of variations in municipal refuse on some incinerator design parameters. ASME Paper No. 67-WA/PTG-2. Presented at Winter Annual Meeting, American Society of Mechanical Engineers, Pittsburgh, Nov. 12-17, 1967. 8 p.

The variability of municipal refuse can have a marked effect on the performance of an incinerator during test, as compared to design expectations. A computer program was developed which can assess this variability in terms of its effect on incinerator design parameters such as gas, air, and quench water flows and temperatures. The computer program, given a refuse composition and heating value, a percent excess air, and a percent heat loss, calculates the products of combustion for a 2,000 lb per hr burning rate. Twenty-one refuse compositions were considered, 11 values of excess air from 40 to 300 percent, and 10 heat loss percentages from 2 to 60 percent. The results of calculations are presented in the form of tables and graphs, and their significance with respect to incinerator design and testing is discussed. It was concluded that the tabulation of refuse compositions selected is probably as typical of what the trend in municipal refuse might be as any which could be generated at this time. Tentative plans for further work involving influence coefficients and correction factors are outlined.

67-0516

Kaupert, W. Refuse incineration with heat recovery. In Proceedings; INTAPUC Ninth International Conference, Paris, June 26-30, 1967. International Association of Public Cleansing. p.145-181.

Types of heat recovery are outlined, including adding air to the flue gas, spraying the flue gas, and thermal exchange. Steam boilers are discussed in greater detail. Advantages of connecting the steam boiler of incinerating plants with the main heater of an existing thermal powerplant are considered. Electrical and other applications of steam from incinerators are examined. The effects of incineration heat recovery on design and operating criteria before, during, and after incineration are described in some detail. Aspects discussed include refuse collection and storage; preparing the refuse; stoking systems; grates; furnace design, with special emphasis on guidance of flue gas, its velocity and temperature; boiler type and design including discussion of boiler temperature and pressure, tube spacing, corrosion, fouling and cleaning; de-slogging; operating time; and profitability.

67-0517

Mandelbaum, P. E. Incinerators can meet tougher standards. American City, 82(8):97-98, 1967.

Comprehensive tests were conducted by the Wisconsin Chemical and Testing Co., Milwaukee, Wisconsin, to determine gaseous emissions and odors from a new incinerator built for the town of North Hempstead, New York. The incinerator's air pollution control train consists of a secondary combustion chamber, a low-velocity expansion or cooling chamber, four banks of high-pressure water sprays, a secondary baffle chamber, and cyclone collectors. Space has been provided for the addition of an electrostatic precipitator, if additional improvements should become necessary. Samples for dustloading determinations were obtained through openings in the chimney well at a point 129 ft above the base of the 265-ft-high stack. Table I presents a summary of the results of the dust-emission rates from the stack on an actual gas basis, while table II summarizes information developed using the dustloading test results and volumetric data. The maximum stack-emission rates with all units in operation range from 47.8 to 65.7 lb of dust per hr. This emission represents 0.096 percent to 0.132 percent of the incinerator charge rate, an excellent air pollution performance. For three unit operation, average carbon dioxide was 3.36 percent to 4.20 percent and stack temperature was 457 F to 487 F. Table III lists the visual stack-emission readings. No readings exceeded an 'equivalent density' of a No. 1.0 Ringelmann. Orsat gas analyses showed CO_2 3.2 percent to 4.2 percent; oxygen 15.2 percent to 16 percent; CO 0.0 percent to 0.1 percent; and N_2 79.7 percent to 81.0 percent. No offensive odors were detected in the sampled stack gases. The result of 14 special dustloading tests taken at various locations within the three units are outlined. The tests demonstrated conclusively that this incinerator's present air pollution control operates well within both present and anticipated future air pollution control standards.

67-0518

Michaels, A. Incineration of municipal wastes without heat utilization. In Proceedings; INTAPUC Ninth International Conference, Paris, June 26-30, 1967. International Association of Public Cleansing. p.131-143.

The necessity of sound engineering design criteria for incinerators is outlined. Methods of obtaining information on characteristics of the waste are briefly presented. The chief functions of incineration without waste heat utilization are combustion and materials handling. Design parameters for the most common systems are given. Problems include oversized burnable wastes and reducing air pollution. Two methods of reducing fly ash emission, a major pollution problem for incinerators: the wet baffle impingement and the dry mechanical system, are discussed. The economics of waste heat utilization are outlined. The low price and excellent handling characteristics of coal make it superior to waste heat steam as a fuel.

67-0519

Michaels, A. Only 15% of all solid wastes is incinerated. Refuse Removal Journal, 10(2):20,22, 1967.

Ten to fifteen percent of all refuse is disposed of by incineration; 20 to 25 percent of urban refuse is disposed of by open burning. Approximately 40 percent is disposed of by landfill. The quantity of particulate emitted by incineration varies from 10 to 60 lb per ton of material burned, and open burning accounts for quantities varying from 60 to 100 lb per ton. Poor refuse disposal by combustion results in the emission of gaseous pollutants, particularly carbon monoxide and hydrocarbons. Good incineration meets an emission limit of 0.85 lb of particulate matter per thousand pounds of gases, corrected to 12 percent carbon dioxide at standard atmospheric conditions; 33 percent of incineration capacity does meet this standard.

67-0520

Modern methods of incineration. Public Cleansing, 57(3):165-171, 1967.

Due to the inevitable shortage of tipping space, partial or entire incineration must be undertaken. Most British Cleansing Officers are impressed with the mechanical and engineering techniques employed in America, since British incinerators have changed little in the last 30 years. Mr. Cockcroft thought there was no doubt that the moving grate was the most efficient burning appliance and therefore must be preferred where economic use of heat is to be made. Plant costs range between Ŀ2,000 and Ŀ3,200 per ton of refuse burned on an 8-hr shift or between Ŀ1,600 and Ŀ2,800 on a 16-hr shift, giving a cost per ton of between 35/- and 45/-. The modern full incineration plant will deal with 8 tons per hr. In an 8-hr shift, 64 tons of refuse, having an average density of 7 cu yd per ton, will be reduced to some 20 tons of clinker. Turning to the incinerator, designs resulted in rotating drum, reciprocating stepped grates, and the circular dump type and rocking stepped grate. The Middleton grate consists of six rotating drums, each 5 ft in diameter by 8 ft in width. The advantages of full incineration are: (1) complete combustion; (2) minimum labor force; (3) high throughput; (4) improved working conditions; and (5) no wide temperature variations. A discussion followed concerning regional disposal, clinker, cost, and maintenance.

67-0521

Montreal incinerator first in North America to generate steam and use precipitators. Modern Power and Engineering, 61(7):68-69,100, 1967.

The Montreal municipal incinerator, the first in North American to produce by-product steam, and the first to incorporate electrostatic precipitators for pollution control, is described together with schematic pictures of the proposed unit, the electrostatic precipitator, and the general layout. The electrostatic precipitator, which will prevent emissions of more than 0.02 lb per 1,000 lb of gas, is centrally located to reduce trucking costs. Garbage will be dumped by truck into a pit, delivered by clamshell bucket to a vibrator and then to the grates with the residue (15% of the original volume) going to a water-filled pit and slag conveyor. The residue, free of organics, will make an ideal landfill or road surfacing material. The unit will produce $750,000 worth of steam a year from 400,000 of Montreal's 1,200,000 tons of putrescible refuse. The furnace temperatures will be maintained between 1,500 and 1,850 F. The lower limit will prevent offensive odors; the upper limit will prevent fusing of flyash in suspension. Estimated cost of processing garbage will be under $5.00 a ton. Sale of steam, scrap, and residues are expected to reduce this value to $2.50 per ton. Ash will be offered to makers of concrete block and light concrete. It is believed that the City of Montreal will have a precisely engineered plant with the most advanced incinerator, based on tried and tested operation.

67-0522

Moore, H. C. Refuse fired steam generator at Navy Base, Norfolk, Va. In Proceedings; MECAR Symposium, Incineration of Solid Wastes, New York, Mar. 21, 1967. Metropolitan Engineers Council on Air Resources. p.10-21.

The utilization of waste heat from municipal incinerators has been considered for some years and earlier batch feed installations with waste heat boilers have produced from 1 to 2 lb of steam maximum per pound of refuse. A cost comparison was made for a complete installation with a refractory furnace enclosure having a convection-type waste heat boiler mounted adjacent thereto, compared with an installation having water-cooled furnace walls integral with a convection type boiler, both having the same refuse burning capacity. It was concluded that the steam production from refuse alone could be increased approximately 38 percent by the use of water-wall furnace. The initial cost of the water-wall installation with fan and flyash collection equipment capacities for 100 percent excess air, practically balanced the initial cost of the refractory furnace and boiler installations with auxiliaries based on 200 percent excess air. The principal saving on operating costs would be in the cost of auxiliary fuel. Based on a continuous boiler output of 50,000 lb steam per 24 hrs per day, the saving in fuel cost would amount to approximately $47,000 per year with oil at $2.81 per barrel. Specifications for each boiler-furnace unit are listed. A longitudinal section through the boiler-furnace unit at the U.S. Naval Base, Norfolk, Va. is illustrated. Calculations indicate that it is logical to expect at least 50 percent greater steam production by this design than in earlier installations. The cost for incinerating equipment and appurtenances was $1,100,000.

67-0523

Move seven million tons a year. Refuse Removal Journal, 10(2):14, 1967.

Rotting refuse and toxic fumes may become a health hazard in New York City. When air pollution control goes into effect in May 1968, there will be an 80 percent increase in the volume of refuse from the apartment houses where most New Yorkers live because improper incinerators will not be permitted. Disposal at sea is not satisfactory. The Staten Island landfill has only a few useful years left.

67-0524

Navy to incinerate rubbish for power. Refuse Removal Journal, 10(4):18, 34, 1967.

Burning refuse to generate power, a practice common in Europe, is developing in the United States. A $2.2 million, 180 ton incinerator at the Naval Station in Norfolk, Virginia, will save $47,000 a year in steam produced. Gases entering the electrostatic precipitator are considerably reduced as compared with refractory incinerators. The heat value of refuse is moving from 5,000 Btu per lb toward approximately 5,500 Btu per lb by 1980. Two and a quarter pounds of refuse may be equivalent to one pound of coal. It can not all be utilized as fuel, but has many potential uses as in a central system for heating and air-conditioning buildings or as a steam supply for industrial processes. A 25 to 40 percent saving in operating costs of New York City's incinerators could result from burning refuse for power. Grates and furnace construction have improved to make burning more efficient. One pound of incinerator refuse can produce 1.4 to 1.8 lb of steam. It takes 10 lb of steam to produce 1 kw hr of electricity. The Issy-les-Moulineaux in Paris burns 450,000 tons of refuse to produce 90 million kw hours of electricity. Germany, Switzerland, and the Netherlands also use burned-refuse-produced heat for most of their power supply. Atlanta, Georgia, paid for its incinerator in 12 years.

67-0525

Netzley, A. B., and J. E. Williamson. Incineration. Mobile multiple-chamber incinerators. In Air pollution engineering manual. Public Health Publication No. 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967. p.428-435.

Mobile multiple-chamber incinerators provide a unique method of on-the-site disposal of refuse. Although their technical efficiency is adequate, they never were widely used because of the availability of more economical disposal methods. Practical and economical solutions to facilitate the design and construction of successful mobile multiple-chamber incinerators are presented. Although the design parameters are identical to the stationary multiple-chamber incinerator, the mobile incinerator must be constructed of lightweight materials and is limited in size to comply with the State Vehicle Code. Design configurations generally limit the maximum capacity of the retort style to 500 lb per hr, and that of the in-line style to 1,000 lb per hr. The draft for mobile incinerators may be produced in two ways: by use of a stack or an induced-draft system that uses air to cool the effluent. A major problem in design of the induced-draft fan system is the proper selection of a fan. The mechanical design and construction of a mobile incinerator, in addition to meeting the requirements of the Vehicle Code, must provide a rigid frame and satisfactory refractory materials. Standards of construction for grates, air inlets, trailer and frame, and auxiliary burners are discussed. Design of an induced-draft fan system for a mobile multiple-chamber incinerator is illustrated in a twenty-one step problem.

67-0526

Netzley, A. B., and J. E. Williamson. Incineration. Multiple-chamber incinerators for burning wood waste. In Air pollution engineering manual. Public Health Service Publication No. 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967. p.436-447.

There are, in general, three methods of burning wood waste: open burning; burning in single-chamber incinerators involving the tepee and silo structures; and burning in multiple-chamber incinerators. While single-chamber silo incinerators have particulate emissions in excess of 12 lb per ton of wood waste, a range of emissions of 1½ to 6½ lb per ton is found for multiple-chamber incinerators. An illustrative problem shows how to design a multiple-chamber incinerator with a mechanical feed system. Combustion, gaseous flow, and dimensional calculation are employed in the solution. Mechanical feed systems consist of: a surge bin for holding saw dust and wood chips; a screw or drag conveyor to move the wood waste; and a pneumatic conveying system which transfers the waste to a cyclone and then into the ignition chamber. Super duty plastic refractories or super duty fire clay firebrick are recommended for the interior lining which may realize temperatures in excess of 2,000 F. Differences existing between the operation of wood-burning and general refuse incinerators are examined.

67-0527

New precipitators for old incinerators. American City, 82(8):40, 1967.

Research-Cottrell will install electrostatic precipitators in two incinerators in New York City. These will be the first municipal units of this type installed in incinerators in the United States. It will require about a year to install these two units, test them, and evaluate the results. If successful, these pilot devices, at about $400,000 apiece, could be the forerunners of a $20 million to $25 million program to equip all 46 furnaces of the city's 11 incinerators with similar control units. Electrostatic precipitators installed in power plants and steel mills will trap more than 95 percent of the particulate matter. Research-Cottrell also has a contract to install four precipitators on the proposed Montreal incinerator, but they will not be ready until after New York tests and installs its devices.

67-0528

New York hassles over incinerators. Refuse Removal Journal, 10(10):14, 1967.

Changes proposed for New York City's new air pollution control laws promise relief for the City's Department of Sanitation as well as apartment house owners. The proposed change would make May 20, 1968 the deadline for upgrading all apartment building incinerators. Landlords installing optional refuse-compacting equipment would be exempted from upgrading. Interpretations that no one was required to upgrade incinerators threaten to deluge the Sanitation Department with unburned refuse that it cannot handle. The confusion caused by the legal interpretations and the building owners' reluctance to furnish funds have resulted in a very slow progress in upgrading. Basic upgrading, estimated to cost a minimum of $5,000, involves installing a firebox to burn the refuse efficiently, and a scrubber that traps the burned particles and prevents them from reaching the air.

67-0529

Open-top incinerator. Compressed Air, 72(1):13, 1967.

An experimental open-top incinerator with an improved combustion method to reduce air pollution is described. One of the DuPont plants which burned nitrocellulose necessitated the construction of the incinerator whose principal feature, in addition to the open top, is that all air for burning is admitted through closely spaced, high-velocity nozzles along the top. Advantages of the open top include simplified material handling for loading and cleaning, elimination of costly roof maintenance, reduction of refractory damage from excessive temperatures, and good combustion characteristics for chemical waste destructors so that burning rates are almost double those with conventional design. Many solid and liquid wastes have been burned satisfactorily by complete combustion, with only metals and ash particles remaining in the furnace. The reduction in size of the incinerator through high burning rates and simplified construction, consisting of a firebrick-lined pit, result in cost reduction of considerable magnitude. In addition, operation is simple and requires a minimum of unskilled labor.

67-0530

Orders precipitator to control pollution from incinerators. American City, 82(8):159-160, 1967.

The Wheelabrator Corporation, Mishawaka, Indiana, has been awarded the contract to install an electrostatic precipitator system in the city's southwest Brooklyn incinerator. The incinerator, built in 1959, has the capacity to handle 1,000 tons of municipal refuse in 24 hr through four refractory furnaces. The Wheelabrator-Lurgi precipitator design for New York includes an evaporation cooling tower in addition to the precipitator. The tower employs a very finely atomized water spray to reduce the temperature of the furnace gases from approximately 1,800 F to a range of from 575 F to 600 F, prior to treatment. The precipitator, which is 23 ft wide, 34 ft long and stands 60 ft high, is a complete turnkey arrangement with the capacity to clean 1,700,000 cu ft per minute of dirty gas, removing 95 percent of the dust in the gas stream before discharging it into the atmosphere. The cost of one installation ranges from $400,000 to $500,000. The collecting surfaces are specially pocketed to prevent the escape of partially burned paper particles into the atmosphere. This design feature will be particularly effective in the United States where great amounts of paper are contained in the refuse. While this is the first installation of a Wheelabrator-Lurgi precipitator in the United States, more than 60 units of this type have been installed in Europe.

67-0531

Pagan, A. R. Low cost pit incinerator extends life of sanitary landfill. Public Works, 98(8):131-132, 1967.

Bergen County, New Jersey, has built a pit incinerator for a total cost of $37,000 in order to reduce such uncompactable refuse as wood pallets, cardboard cartons, and fiber barrels. Following inspection of a pit used by DuPont Chemical Co. in South Jersey, a similar facility was built. The pit is lined with low-duty firebrick and is about 8 by 10 by 10 ft. Exterior walls are of cinderblocks, reinforced with steel irons with a steel frame or collar on the top of the pit to provide rigidity. Because this pit was installed on the Hackensack Meadowlands, piles were driven to support the pit, the engine, and the pipeline connecting the blower to the nozzle. A steel cage surrounds the top of the underground pit to stop the larger pieces of flyash. Forced air, provided by the engine and blower arrangement, is fed to small pipes with two rows of nozzles aimed downward (about 45 degree angle) at the burning rubbish below. To date the pit has functioned on a one shift basis, with about 40 tons per day incinerated. Practically all refuse disposed in this way has been wood.

67-0532

Precautions for tepee-type burners. American City, 82(5):44, 1967.

To minimize air pollution from tepee-type burners the P. H. S. recommends: burner should be charged by a conveyor belt; and materials producing heavy smoke should be discharged at a landfill. Garbage should not be more than 20 percent by weight of the refuse, and it should be mixed uniformly with dry combustible refuse. Ash should be cooled and wetted before placement in a landfill.

67-0533

Reid, R. L., and E. R. Kaiser. Incineration--municipal operations. In Proceedings; Solid Waste in Urban Environments--A Community Action Seminar, Houston, Mar. 9, 1967. University of Houston. p.55-58.

Incineration is attracting favorable attention as an effective and economical method for maximum reduction of refuse weight and volume. Incinerator residue occupies only one-fifteenth the space of raw refuse. The cost of municipal incinerators is in the range of $5,000 to $10,000 per-day ton of the daily capacity, based on 24-hr operation. The total cost of incineration, including amortization, operation, and maintenance ranges from $3 to $6 per ton of refuse. The features of a conventional incinerator include the following facilities: a site near a residue disposal area; a building of pleasing architecture; a scale for recording tonnages; concrete-lined pits 30 to 40 ft deep with storage capacity of at least 36 hr supply; one or two overhead cranes; two or more incinerator furnaces, each with stoking grates, forced air fans, secondary chambers, and flues; a method of quenching refuse and transferring it to trucks; fly ash collectors; an exhaust system of either a tall, natural draft chimney or induced-draft fans with shorter chimneys; and controls for semi-automatic operation. To determine the number and size of furnaces, the maximum weekly refuse load may be divided by 6 and then divided by an availability factor of 80 to 85 percent. The major advance in incinerators is being made in adapting modern dust collectors to incinerator service. The trend toward better air pollution control favors steam generation. Therefore an incinerator might be built in a populated area that has need for steam or steam-generated electric power. Some other new developments in the incinerator field are: an incinerator for burning oversized waste; reuse of water in incinerator plant stokers for burning refuse more completely; pyrolysis; waste heat, and slag recovery.

67-0534

Ridgley, A. B. Light commercial incinerator selection and operations. In Proceedings: Solid Waste in Urban Environments--a Community Action Seminar, Houston, Mar. 9, 1967. University of Houston. p.52-54.

The selection and operation of light commercial incinerators, which include units ranging in size from 500 lb per hr to approximately 2,000 lb per hr, is discussed. The factors involved in proper selection are: type of material to be destroyed; collection of the material and location of the incinerator; time to be allotted for collecting and feeding the incinerator; storage areas and room for stoking; adequate air supply; air conditioning, ventilating fans, etc. that may have a demand on the air supply; auxiliary equipment such as gas washer or ash collector; availability of utilities for natural gas and/or electricity; location of stacks; and current local codes and ordinances. Wastes and incinerators are classified by criteria compiled by the Incinerator Institute of America. Since the wide use of incinerators in multi-story apartments and buildings is just starting in the Houston area, it is recommended that strict codes be adopted to assure pollution-free destruction of trash. When selecting a destructor, the amount of time allocated to feeding or cleaning the unit must be considered. The average I.I.A. incinerator has a reduction of approximately 90 to 94 percent of the waste to be destroyed by weight. Incinerators that are designed according to these criteria are calculated by pounds of refuse per square foot of grate or hearth area and the length of gas travel. Temperatures are raised by the trash itself or by auxiliary burners to a degree high enough to let larger ash particles settle out. Many manufacturers are incorporating methods to use the heat release for worthwhile purposes such as heat boilers, heat exchangers, dryers, and other uses.

67-0535

Riley, B. T., and J. A. Dorsey. Evaluation of open pit incineration for solid waste disposal. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. C-5.

A joint study to test and to evaluate a pilot trench incinerator by the Solid Wastes Program and the National Center for Air Pollution Control is described. The components of the pilot unit are listed. A firebrick lined pit and combustion-air equipment will allow materials to be burned under controlled conditions. All gaseous and particulate combustion emissions will be collected. Three types of determinations will be conducted for each experiment: characterization of the fuel and residue; definition of the combustion conditions; and identification of the combustion emissions. Each experiment will be conducted on a batch basis.

67-0536

Sableski, J. J., and J. E. Williamson. Incineration; flue-fed apartment incinerators. In Air pollution engineering manual. Public Health Service Publication No. 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967. p.447-460.

In the flue-fed incinerator used in apartments, schools, hospitals, and office buildings, the chimney also serves as a chute for refuse charging. The composition range (% by wt) of apartment house refuse is: dry paper, 50 to 100; garbage, 0 to 30; plastics, 0 to 3; noncombustibles, 2 to 10; and other, 0 to 10. The air pollution problem of flue-fed incinerators is evidenced by the escape of large quantities of fly ash from the stack along with white or light gray smoke. There are three basic methods of altering this condition: installation of an afterburner on the roof, in the basement, or installation of a multiple-chamber incinerator. A roof afterburner is supplemented by a damper at the base of the stack to control the excessive draft and burning rate. Chute door locks are installed to prevent damage to the draft control damper from charging during burning. A basement afterburner uses a damper at the base of the stack and an afterburner directly above it. Advantages and disadvantages of roof and basement afterburners are listed. Emission data for all three types are given. An illustrative problem shows a calculation of the size of a barometric damper for a multiple-chamber incinerator.

67-0537

San Francisco gets funds for incinerator study. APWA Reporter, 34(7):25, 1967.

The City and County of San Francisco has received a $117,193 U.S. Public Health Service Solid Wastes Program grant to develop a solid wastes incinerator capable of meeting rigid air pollution restrictions with minimum control equipment. The grant covers two-thirds of the first year cost of the project, which is now expected to run for three years at a total cost of about $760,000. Project engineers hope that more complete combustion will be achieved with a new type of mechanical grate and better utilization of air in combustion chambers of an improved design, thereby making it possible to eliminate certain conventional control devices. The project contemplates construction of a prototype incinerator with a capacity of 100 to 150 tons of solid wastes a day, but designed to duplicate operating conditions in a fullsize incinerator. (This article also appears in Refuse Removal Journal, Volume 10, Number 10, page 40, October 1967.)

67-0538

Schloerke, K. W. Guide to incinerator installations. Air Conditioning, Heating and Ventilating, 64(5):G27-G32, 1967.

Basic criteria are given for the selection of the correct type and size of incinerator and accessories. Tables are given which show: the types, composition, and heat values of various wastes considered for disposal; a classification of incinerators; an incinerator sizing guide; the minimum auxiliary fuel requirements, a guide to chimney sizing, and theoretical combustion air requirements. Included are photographs of five types of incinerators and schematic drawings of four types of incinerators. The size and type of incinerator can be determined from the volume, type, and weight of waste together with the time allotted for incinerator operation. Except for type 0 waste, a highly combustible paper, cardboard, carton and wood mixture, auxiliary fuel is required. This may be as high as 8,000 Btu per lb as for type 4 wastes, which are composed of human and animal refuse from hospitals, laboratories, and abattoirs containing up to 85 percent moisture. In the primary chamber, the auxiliary gas burners ignite, preheat, and maintain efficient burning temperatures. In the secondary chamber, the burners control the temperature, destroy odors, and provide better operation, even with careless operators. The regulation of incinerators by air pollution control agencies imposes a burden on incinerator manufacturers because of the lack of a uniform code of requirements. Data are furnished to permit the selection of an adequate incinerator, and the importance and need for uniform incinerator codes is emphasized.

67-0539

Sebastian, F. P. San Francisco's solid wastes crisis. Civil Engineering, 37(10):53-55, 1967.

Recently San Francisco's Environmental Pollution Committee has been studying new methods of refuse disposal. Composting, incineration at sea, and various other methods were found to be either too costly, impractical or illegal. The committee concluded that European incinerators, equipped with electrostatic precipitators could meet the standards of Bay Area Air Pollution Control. In these new European designs, the temperature of combustion gases is reduced to 250 C by heat transference to the water jacketing the boiler. This reduces the volume of the exhausting gases by about one-half, and therefore a smaller precipitator can be used. Sale of the energy can cut the net cost of the operation. The article includes a schematic drawing of London's new Deepham Refuse Disposal Works, which will be completed in 1970. New features are constant operation and elimination of presorting. An estimated 147 tons per day of saleable metals will be recovered from this plant which will have a capacity of 1,667 tons per day of refuse. Pacific Gas and Electric in San Francisco has offered a 20-year contract to purchase the by-product steam generated if a garbage incinerator is built in the adjacent site. The central location of the site would allow convenient hauling away of the remaining inorganic sterile ash and by-products. Cost for the incinerator would be $13,500,000, or an increase of $2.00 per household per year, or $2.60 per year without energy recovery.

67-0540

Solid Wastes Program. Methods of study. In Report on the municipal solid wastes incinerator system of the District of Columbia. Cincinnati, U.S. Department of Health, Education, and Welfare, June 1967. p.6-16.

Extensive review and analyses of past incinerator records were made. These analyses indicate variations of solid wastes loads, long-term incinerator performances, and long-term loading trends. The District of Columbia maintains daily records of incoming solid wastes received at each incinerator categorized by the following types: household, commercial, federal, street, ash and special, and confidential. Data covering the period of 1955 to the present were reviewed and analyzed as a basis for the development of background characteristics for: waste loadings, loading rates, and approximate reduction performance of the four incinerators. A one week, intensive, on-site study of each incinerator included observations and data collection of weights of solid wastes delivered to the incinerator, weights of residue discharged from each incinerator, smoke studies of stack discharges, and furnace charging rates. Samples of incinerator residue and quench waters were collected at selected intervals and analyses were conducted on the residues to determine moisture content and percent combustibles remaining. Analyses conducted on the quench waters included: pH, specific conductivity, suspended and dissolved solids, chlorides, sulphates, phosphates, hardness, and alkalinity. Reduction of solid wastes was determined on two bases: weight reduction with moisture, and actual weight reduction with the moisture content of the residue subtracted. The specific incinerator conditions and operating characteristics observed were: weighing facilities, unloading, charging rates, furnaces, residue quality, general housekeeping efforts, and stack emissions. A tentative rating method was utilized to indicate overall acceptability of the facilities.

67-0541

Solid Wastes Program. Reports on individual incinerators. In Report on the municipal solid wastes incinerator system of the District of Columbia. Cincinnati, U.S. Department of Health, Education, and Welfare, June 1967. p.17-55.

The four incinerators investigated were: O Street, Georgetown; Mt. Olivet; and Ft. Totten. A brief background is given for each incinerator including construction facts, number and capacity of furnaces, and descriptions of other equipment. Incinerator conditions and operating characteristics covered are: weighing facilities; unloading and charging procedures; furnace design; residue and fly ash collections; personnel facilities and general sanitation; and special problems.

The indices of incinerator efficiency were: weight input, weight output, reduction with moisture, actual weight reduction, loading rate, temperature, residue quality, and stack emissions. Recommendations were made for increasing the efficiency of the various operations. The Solid Wastes Program Tentative Rating Method for Incinerator Operation was used to compare these to an ideal plant rated 100 points. Resulting average scores of from 46 to 51 were placed on the four operations and each was given an unsatisfactory rating.

67-0542
Solid Wastes Program. Appendices. In Report on the municipal solid wastes incinerator system of the District of Columbia. Cincinnati, U.S. Department of Health, Education, and Welfare, June 1967. p.56-77.

The Solid Wastes Program Tentative Rating Method for Incinerator Operation includes criteria for access roads, employee facilities, communications, fire prevention, accident prevention and safety, operation records, operational maintenance, limited access, area sanitation, building sanitation, weighing facilities, unloading areas, dust control at unloading areas, capacity and operation of storage pits, segregation of refuse, furnace temperature control, residue and emission quality, sewage solids, and other hazardous materials, salvage, open burning, vector control, and disposal of quenching and scrubbing waters. Scoring for each item is indicated. The time schedules for the study teams and sampling schedules for residue and quench water are listed. An explanation of the method of analysis of data and development of figures is given and results of incinerator residue and quench water sample analyses are listed.

67-0543
Southern city to build incinerator. Refuse Removal Journal, 10(3):18, 1967.

The city of Baton Rouge, Louisiana, is constructing a new refuse incinerator which will be able to handle all types of municipal solid wastes without problems of odor, smoke, or fly ash. The initial investment will be $2,900,000, and the incinerator is expected to operate at a cost of $2.25 per ton of refuse burned. The design for the unit includes a reverse-reciprocating grate which will ensure rapid and complete combustion at temperatures of about 2,200 C. Two water-wall boilers will cool the flue gases, after which they will enter electrostatic precipitators. The precipitators will clean them so that less than 0.15 grains of particulate matter per cu ft of gas will leave the furnace in the gas stream. This rate of emission is considered to constitute a major step toward the elimination of air pollution. The unit is also equipped with a water-cooled panel construction, which will prevent slagging of the furnace walls and reduce maintenance costs and down time. In addition, a bulk refuse grinder will handle all bulky items and render them efficiently burnable. The design for the incinerator and plans for operation incorporate several features which will help offset operating costs. The boilers will generate about 3.5 lb of steam per lb of refuse burned, part of which will be employed in plant power generation, and part of which will be sold. Scrap metal, the incinerator ash residue, and waste heat will also be salvaged. The incineration plant is expected to be finished by the summer of 1969.

67-0544
State takes steps to control gob pile, incinerator emissions. Kentucky State Department of Health News & Plans, 14(6), 1967.

Two new steps recently taken by Kentucky's Air Pollution Commission in continuing efforts to control the state's air pollution problems are: strict regulations governing incinerator design, and a pilot study of gob-pile fire control. The commission also adopted regulations to: (1) prevent, abate, and control the emission of air contaminants from coal refuse disposal and incinerators; (2) regulate the practice of burning combustibles in the open; and (3) control the emission of air contaminants from waste burners.

67-0545
Sullivan, P. M. Composition and characteristics of incinerator residues. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 25-28, 1967. Conference Preprint No. C-8.

A Bureau of Mines project showed that reliable samples of incinerator residues can be obtained. Glass constitutes the major fraction of the residues and large amounts of unburned paper found show the need for more efficient burning. Salvage of metals alone could nearly double the life expectancy of residue landfill sites and reduce haulage costs by 50 percent. The type of residue discharge facilities at the various incinerators tested determined the sampling procedure. The normal size sample was 2 to 3 percent of the gross output, taken over a period of 4 to 5 hr. A table gives weight, density, and percent of the constituents of six sample residues.

67-0546
Talens, P. G. Incineration. Pathological-waste incinerators. In Air pollution engineering manual. Air Pollution Control District County of Los Angeles. Public Health Service Publication No. 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967. p.460-471.

Incinerators used for burning of pathological waste including organs, bones, muscles, other tissues, and organic waste are discussed along with crematory furnaces. Pathological waste incinerators can produce emissions of fly ash, smoke, gases, and odors that would be highly objectionable. A principal consideration in the design of pathological waste incinerators is provision for the release of fluids as the material is destroyed. Three general categories of design calculations are: combustion calculations, flow calculations, and dimensional calculations. Design of the ignition chamber, the secondary combustion zone stack and crematory is presented. A table outlines operating procedures for a crematory. An adaptation of the design for the retort-type multiple-chamber incinerator with three configuration differences may be used for pathological waste. The changes are: use of a solid hearth instead of grates, a provision for heating the hearth to evaporate fluids more rapidly and heat solid material lying there, and use of a side charging door. An illustrative problem shows a method for designing an incinerator.

67-0547
Tests promise better incinerators. American City, 82(8):40, 1967.

Tests conducted to develop cleaner burning incinerators that emit less soot, noxious gases, and other air pollutants, are described. The tangential overfiring technique was tested with three small incinerators. Synthetic refuse(in which the volatile matter and moisture content were carefully controlled) was burned in a cylindrical chamber supplied with air from above. The air swirled in at an angle, spiralling down the combustion chamber wall toward the refuse bed. This technique produces several advantages: (1) It permits excellent flexibility in controlling the air-flow, an important factor in achieving complete combustion. (2) Air swirling down the hot inner wall of the chamber becomes preheated, promoting greater thermal efficiency for the incinerator. (3) Refuse particles rising through the chamber in the exhaust gases have more time to burn completely since the exhaust also flows in a spiral pattern. Virtually complete destruction of the wastes and the emission of clean, innocuous exhaust gases resulted from the tests of the tangential overfiring principle. Researchers believe that further studies with larger models can lead to commercial use of this improved combustion method. Single copies of the Report of Investigations 6908, 'Experimental studies of incineration in a cylindrical combustion chamber,' are available free from the Publications Distribution Section, Bureau of Mines, 4800 Forbes Avenue, Pittsburgh, Pa. 15213.

67-0548
300-ton facility set for St. Louis. Refuse Removal Journal, 10(12):17, 1967.

A new 300-ton incinerator in St. Louis will be financed by a $3,373,000 bond issue passed in November, 1966. Construction will begin in about 10 months and is expected to take about 2 to 2.5 years. The plant will be erected adjacent to one of the city's present sites and will include air pollution controls in its cost. The facility was recommended by the consulting firm of Horner & Shifrin after a $200,000 study, which also recommended installation of air pollution controls at the south-side incinerator, construction of log-disposing facilities at the city workhouse, and other incinerator improvements. Future improvements included expansion of the south-side plant and conversion of furnaces to replace batch-feeding with continuous-feeding systems.

67-0549

To give incinerator operations course. Refuse Removal Journal, 10(9):74, 1967.

A 15-week course in incineratory technology is being offered again by the Incinerator Committee of the American Society of Mechanical Engineers in cooperation with the Westchester County (N.Y.) Department of Health, the New York State Department of Health, and the White Plains (N.Y.) Board of Education. Two-hour lectures will be held on consecutive Wednesday afternoons ending December 20, 1967. Registration fee is $30.00.

67-0550

Two major cities building incinerators. Refuse Removal Journal, 10(1):37, 1967.

A $4 million incinerator will be built in Washington, D. C., to replace the ever smouldering Kenilworth dump which is the worst source of air pollution. Montreal will build a large scale incinerator with electrostatic precipitators.

67-0551

Vaiana, S. J. Clean stack gas and reliable power. Power, 111(5):91, 1967.

Services connected to the emergency diesel generator, a caterpillar D-39, at St. Vincent's Hospital in New York City, are discussed. Five thousand pounds of refuse per day are fed manually through chutes in the top of a Sargent incinerator. Hot gases resulting from the burning of dry material evaporate moisture from wet material entering through a separate chute. The afterburner raises the gas temperature to avoid condensation in the stack and a conspicuous plume at the outlet. A forced draft blower supplies air through tuyeres in the air-cooled sidewall. Hot gases pass through four double sprays of water. While traveling downward through a gooseneck, the gases drop out practically all their wet particulate matter before turning upward to enter the stack. Sludge is removed manually every day from the bottom of the shell containing the gooseneck. Operation of the burners, fan, and watersprays is automatic. Impurities in the gases leaving the stack are within limits imposed by Law 14 of the New York City Air Pollution Control Commission.

67-0552

Walker, A. B. Air pollution control equipment for incinerators. In Proceedings; MECAR Symposium, Incineration of Solid Wastes, New York, Mar. 21, 1967. Metropolitan Engineers Council on Air Resources. p.75-81.

The effluents of an incinerator furnace are odors, noxious gases, and particulates. Odors can usually be eliminated by non-catalytic oxidation where temperatures are maintained above 1,500 F for periods exceeding 0.5 seconds. The municipal incinerator is not a major contributor to gaseous pollution while the flue-fed incinerator might be a little more serious with regard to noxious gases. A reduction of about 50 percent in noxious gas emission has been shown using overfire air jets and auxiliary gas burners and a 22 percent reduction using a wet impingement scrubber at about 7-in. pressure drop. The use of overfire air jets and auxiliary burners can be expected to reduce particulate emissions by about 50 percent in flue-fed incinerators. Efficiencies for control equipment on municipal incinerators are in the range of 20 to 30 percent for the settling chamber, 10 to 53 percent for the wetted refractory or metallic baffle, 75 to 80 percent for dry cylconic collectors, 93 to 96 percent for impingement scrubbers, in excess of 94 percent for electrostatic precipitators, and in excess of 99 percent for full-scale precipitators and fiberglass bag filters. The choice of control equipment for desired air pollution objectives must include consideration of the useful life of the plant, capital costs, capital investments for base collector and all auxiliaries, operating costs for water and electric power and maintenance, the dispersion capability of the stack and the water-vapor plume.

67-0553

Walsh, R. T. Combustion equipment. In Air pollution engineering manual. Public Health Service Publication 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967. p.507-560.

Air contaminants generated from gaseous and oil fuel burning fall into three categories: carbon and incomplete combustion materials; sulfur oxides; and nitrogen oxides. Air pollution control methods involve prohibition regulations against sulfur emissions and removal of sulfur and ash from fuels. Combustion equipment producing air contaminants includes gas and oil burners, boilers, heaters, and steam generators. In the same category as gas and oil burners, are: partially aerated burners; multiple-port gas burners; and forced-draft gas burners. The air pollution problem of smoke, ash and sulfur oxides, and nitrogen oxides, and control equipment are described. Some boilers, heaters, and steam generators are: industrial boilers and water heaters, power plant steam generators, refinery heaters, hot oil heaters, and boilers. The associated air pollution problems of solid particulate emission during normal oil firing, soot blowing particulates, sulfur dioxide, sulfur trioxide, excessive visible emissions, and oxides of nitrogen, are presented. Control equipment is necessarily limited to power-plant steam generators or other fired combustion equipment of comparable size. Some of the control equipment and methods that have application are: scrubbers for sulfur oxides, baghouses and precipitators, alkaline additives to neutralize sulfur trioxide, carbon adsorption of sulfur oxides, scrubbing NOx, and adsorption of NOx.

67-0554

Water baffles to end incinerator ash fallout. Civic Administration, 19(12): 15, 19, 1967.

Two square furnaces costing $850,000 will increase the capacity of the Winnipeg, Manitoba, incinerator from 550 to 750 tons daily when they replace four round furnaces. The square-type furnace burns constantly and can discharge ashes while in operation. Before the ashes hit the waiting truck, they are doused with water to cool them. One square furnace is presently in use.

67-0555

Weber, C. C. Incinerator inspection; what to look for. Public Works, 98(5):133-134, 1967.

Regulatory agencies inspect incinerators to: determine compliance, investigate complaints, and gather information. Operating agencies: evaluate efficiency, improve operation, provide maintenance, and modification, note time and temperature, and inspect weekly. They also inspect safety factors: rails, belts, chains, fire-fighting equipment, goggles, and observance of rules; inspect availability, condition, and cleanliness of: scales, tipping, floor, storage bin, charging facilities, drying facilities, furnaces, grates, refractories, hand tools, residue removal equipment, quenching facilities, disposal of liquid wastes; transport of residue to disposal facilities; and air pollution control equipment. Stack sampling should be done to determine quantity of emissions.

67-0556

Wegman, L. S. The cleanest incinerator stack gases. American City, 82(5):89-91, 142-144, 1967.

The new incinerator on Long Island, New York, must have good equipment to remove polluting material from stack gases because it is near residences. After leaving the settling and expansion chamber, the gases pass through a spray chamber, air-cooling chamber, cyclones, induced draft fan, and a flue before reaching the stack. The control loops were color-coded. Orange control loop is for under-grate air control. Red holds the temperature at furnace exit constant at 1,800 F. Brown controls the Research-Cottrell cyclone collectors. Green is gas temperature control by spray water cooling. Yellow is additional gas temperature control by air cooling. Instruments record data concerning control. There is a fail-safe damper system and bypass flue. In event of a power failure, the automatic damper opens permitting gases to by-pass cyclones and induced draft fans, thereby preventing possible damage to them. To reduce slagging and extend furnace life, silicon carbide and air-cooled walls were used in furnace construction.

67-0557
Wegman, L. S. An incinerator with refractory furnaces and advanced stack gas cleaning systems. In Proceedings; MECAR Symposium, Incineration of Solid Wastes, New York, Mar. 21, 1967. Metropolitan Engineers Council on Air Resources. p.34-42.

The new incinerator serving the Long Island, New York, north shore area of North Hempstead is described. The plant contains 3 furnaces rated at 200 tons per 24 hr each. Each of the two receiving bins and unloading areas can accommodate six trucks simultaneously, and the total water level bin capacity exceeds 200 percent of the plant capacity. Two cranes, rated at 2½ tons, transfer refuse from the bins to the furnace loading chutes. The effective grate area is 267 sq ft or 62.4 lb per hr per sq ft of grate. Heat release is 306,000 Btu per sq ft per hr. The furnace volume is 5,300 cu ft of 26.5 cu ft per ton of rated capacity. Instruments record the following data: main grate underfire and overfire air flow; furnace temperature downstream of sprays; gas temperature in the cyclones; furnace draft and induced draft fan amperes; and induced draft fan speed and cyclone differential pressure. Extensive use was made of silicon carbide and air cooled walls in the furnace construction. The plan employs two water systems for quenching, sluicing, and fly ash removal. Tests indicated that the furnaces are operating at design standards and that the stack effluent is well within present or anticipated air pollution control standards, achieving an emission in the range of 0.2 lb per 1,000 lb of gas corrected to 50 percent excess air.

67-0558
Weintraub, M., A. A. Orning, and C. H. Schwartz. Experimental studies of incineration in a cylindrical combustion chamber. U.S. Bureau of Mines Report of Investigations No. 6908. [Washington], U.S. Department of the Interior, Oct. 1967. 38 p.

In the incineration of combustible waste, the effect of dimensional parameters, process variables, and fuel properties on the operation of an incinerator that consisted of a single cylindrical combustion chamber, in which all combustion air was supplied tangentially above the fuel, was investigated. Construction and operation of three designs of such a device proved that the tangential overfire air design is effective in providing efficient combustion and low concentration of particulate matter in the effluent gas. A correlation was found that related burning rate with air rate, chamber diameter, and inlet port diameter. In one of the incineratory models, ignition was by radiation from a preheated surface. The temperature of this surface was required to be 1,400 F to 1,600 F to insure ignition of moist refuse; however, this had little effect on combustion rates. In the combustion of moist refuse, evaporation of the water proceeded through the fuel bed as a wave, with an ignition wave following the evaporation.

67-0559
Weintraub, M., A. A. Orning, and C. H. Schwartz. Apparatus and test procedures. In Experimental studies of incineration in a cylindrical combustion chamber. U.S. Bureau of Mines Report of Investigations No. 6908. [Washington], U.S. Department of the Interior, Oct. 1967. p.4-10.

The apparatus used included a model M-10, model M-30, and model R-7. Model M-10 was constructed from a 55-gal stainless steel drum with no refractory. Two tangential air ports 180 degrees apart were located at each of four levels. The model M-10 was charged with white pine sawdust and continuous records of temperature and carbon dioxide content of the exit gas were made. Model M-30 was a double-walled combustion chamber having diameter of 30 in. and a height above the grate of 63 in. Four tangential ports were equally spaced on the circumference of the inner wall. Model M-30 was charged with sawdust. Particulate matter analysis and continuous carbon dioxide and oxygen concentrations were taken. Model R-7 consisted of a 55-gal stainless steel drum top portion, and a 55-gal carbon steel drum bottom portion. The roof was made of insulating firebrick covered with insulating cement. In the test position, the roof of the hood section was 35 in. above the top of an 18-in. bed giving a volume of 5.74 cu ft above the initial fuel level. Standard charges of fuel with maximum 50 percent moisture content were used. Hold temperatures, bed temperatures, and percentage of carbon dioxide and oxygen were noted by automatic recording instruments.

67-0560

Weintraub, M., A. A. Orning, and C. H. Schwartz. Discussion of results. In Experimental studies of incineration in a cylindrical combustion chamber. U.S. Bureau of Mines Report of Investigations No. 6908. [Washington], U.S. Department of the Interior, Oct. 1967. p.11-38.

An incinerator utilizing the principle of tangential overfire air in a single cylindrical combustion chamber is effective in the destruction of combustible wastes with the emission of clean and innocuous gases. The burning rate in the devices studied was a function of the air rate. The ratio of burning rate to air rate, and hence the amount of excess air, could be correlated with the dimensions of the combustion chamber and the linear velocity of the inlet air by a modified Reynolds number. Combustibles of high moisture content burned in a refractory-lined chamber with greater excess of air than drier combustibles burned in an unlined chamber of approximately the same dimensions. Specifically, sawdust containing 8 percent moisture could be burned in model M-10, at the rate of about 6 lb per hr per sq ft of grate area with an average excess air of 40 percent; sawdust could be burned in model M-30 at the rate of 12 lb per hr per sq ft of grate area with stoichiometric air; high moisture content refuse could be burned in model R-7 at about 30 lb per hr per sq ft (13 lb per hr per sq ft based on the dry fuel) with about 90 percent excess air.

67-0561

Williamson, J. E., and R. J. MacKnight. Incineration. Design for multiple-chamber incinerators. General refuse incinerators. In Air pollution engineering manual. Public Health Service Publication No. 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967.

The standards presented are tools for creating designs for multiple-chamber incinerators that may be expected to burn rubbish with a minimum discharge of air contaminants. Two basic types of multiple-chamber incinerators are compared: the retort type, named for the return flow of gases through the 'U' arrangement of component chambers, and the in-line type, so-called because the component chambers follow one after the other in line. Principles of combustion, fundamental relationships of design, and general design factors are discussed. Cutaways of a retort and in-line multiple-chamber are shown. The basic factors that cause performances to differ in the two incinerators are examined. A retort incinerator performs more efficiently in the capacity range of 50 to 950 lb per hr. The in-line incinerator is well suited to capacities of 1,000 lb per hr or higher. Control of the combustion reaction, and reduction in the amount of mechanically entrained fly ash are most important in the efficient design of a multiple-chamber incinerator. A table lists the basic parameters, evaluation factors, and equations for designing multiple-chamber incinerators. A graph shows the relationship of grate loading to combustion rate.

67-0562

Wright, R. O. Incineration. Colorado Municipalities, 43(10):246, 258, 259, 261, 1967.

Incineration is compared to sanitary landfilling. Incineration reduces refuse volume and makes it inoffensive, but land is still needed for final disposal. Initial cost ranges from $2,200 to $4,500 per ton of rate capacity. Operating costs range from $2.00 to $6.50 per ton. Scrubbing equipment or fly ash control apparatus should be included. When fill sites are more than ten miles from the collection area, incineration is often more economical. For small communities, a large regional incinerator is more economical. For Aurora, Colorado, a 150-ton capacity incinerator is needed for its 75,000 persons.

67-0563

Wuhrmann, K. A. Pros and cons of heat recovery in waste incineration. In Proceedings; Second Annual Meeting, Institute for Solid Wastes, Boston, Oct. 3-5, 1967. Chicago, American Public Works Association. p.29-36.

The heat resulting from the incineration process is useful insofar as it guarantees continuance of combustion. The chief drawbacks of combustion at high temperatures are: increased corrosion and heat stress for the furnace material, and encrustations of waste ingredients which melt rather than burn. These drawbacks, as well as the necessity of cleaning the combustion gases at moderate temperatures, call for temperature control in the combustion chamber. As a demonstration of the consequences of different gas cooling methods, a diagram shows the state of the combustion gas in a field of temperature and humidity. Other diagrams illustrate: absorption of heat by cooling air; flow of incineration energy; difference in operation costs between plants with and without heat recovery; probability of refundment of the supplementary cost for steam or power production; and the wide range of steam temperatures utilized by 20 European and two American plants.

INCINERATION–Europe

67-0564

Andritzky, M. Explanation and testing of the emission dust control installation at the Munich Refuse Power Works, North 1. Brennstoff-Waerme-Kraft, 19(9):436-439, 1967.

For large incinerators, burning particulates in the final emission should not exceed 150 mg per cu m (normal conditions) at 7 percent carbon dioxide. A guarantee of 99.53 percent dust removal was required for Munichs's Refuse Power Works North 1. The effect of degree of dust removal on installation cost is shown in Figure 3 of the article. The quantity of dust in raw gas, which varies between 6 and 17.5 g per cu mgn, depends upon: granular constituency of the refuse; grate construction; working relationship between grate and boiler; and the efficacy of the boiler as a settler of fly ash. Particulates from refuse firing have a lower electrostatic resistance than those from coal-dust firing. With 61.2 sq m of free filter cross section, there is available, for mixture management, an exhibited gas velocity of 1.04 m per second and a dwell time in the electrostatic field of 8.55 seconds. Correct values for fly ash and results of trial studies on the boiler and electrostatic filter are shown in tables. Steam Producer 1 has been in operation 11,000 hr. No trouble with the filter has developed; corrosion is not evident. The effects on emission dust control of changes in refuse composition in the future cannot be foreseen.

67-0565

Andritzky, M. Layout and experience with flue gas dust removal in the refuse power plant North 1, Munich. Brennstoff-Waerme-Kraft, 19(9):436-439, 1967.

The dust filters in the power plant for refuse combustion were designed so that the carbon dioxide content in the flue gas and the dust concentration do not exceed 7 percent and 150 mg per cu m. The boilers were designed for combined combustion of coal and refuse. The operation of the plant was studied and the dust removal efficiency was plotted vs. the dust concentration in the gas before the electric filter. Also the effect of the refuse particle size and the electric dust resistance on the dust removal efficiency were determined. Tests were made with firing of coal and refuse alone or with mixed firing. The dust removal efficiencies were found to be 99.56 to 99.89 percent which was better than warranted. The boiler and filter units were in operation for 11,000 hr without failure or signs of corrosion. (Text-German)

67-0566

Automatic refuse incinerator. Surveyor and Municipal Engineer, 123(3755):61,1967.

An incinerator for domestic refuse from multi-story blocks of flats, offices, hospitals, and hotels is described. Fully automatic and hygienic, it reduces refuse to 10 percent of its original size and allows waste from a whole block to be collected in one place. The result is a significant cut in operating cost and time. Particulars and prices may be obtained from the address given in the article.

67-0567

Barniske, L. Starting operations at the waste incinerator plant in Berlin Ruhleben. Brennstoff-Waerme-Kraft, 19(10):487-488, 1967.

After a construction period of 2½ years, the test operation of the first large waste incinerator in Berlin was started. By August 1967, three furnaces were in operation; a fourth one is to be completed by October of this year. The last two furnaces will be finished by 1969. The plant has a capacity of 1.6 times 10 to the sixth cu m of waste, and it can burn half of the amount of waste accumulating in West Berlin. The construction of a second incinerator plant for the city will begin in 1970. The furnaces are equipped with roller grates. Cranes bring the waste to the incinerators. When the heating value of the waste drops below 1,100 kcal per kg, i.e. if the temperature in the combustion chamber drops below 900 C, additional oil burners aid the incineration process. The flue gases with temperatures between 900 and 1,000 C are cooled to 200 C, cleaned in electro-filters and exhausted into the open air through two chimneys with a height of 76 m. The slag is sintered for use as construction material. The plant operates 5 days a week; 50,000 tons of household wastes have been burned so far. Illustrations and technical data of the plant are given. (Text-German)

67-0568

Barton, A. E. Tests on emission from refuse incineration chimney stacks. Public Cleansing, 57(1):29-56, 1967.

The Clean Air Act of 1956 states'...dark smoke shall not be emitted from a chimney of any building...'. A main cause is the low intensity burning of the old-fashioned grate. Tests of grit and dust emissions were made at disposal works at Lifford, Tyseley, Sutton Coldfield, and Derby. At Lifford it was found that 160 lb of dust spread over the district every hour. As the temperature falls, dust emission rises. Tyseley has a batch type unit. There is no grit settling chamber but a waste boiler will reduce grit emissions. Emissions in pounds per hour and concentrations in grain per cubic feet are higher than Lifford, a newer plant. A water spray trap reduced dust at Sutton Coldfield and Derby. Emission of noxious gases were tested with ORSAT apparatus. Expansion of incinerator use is expected because of lack of land for tipping. A gas cleaning plant is a costly auxiliary. Because the nature of refuse is changing, the nature of fuel for incinerators is changing and it is uncontrolled. The content of paper, plastics, and non-returnable bottles is rising. The life of a 'Squeezy' container may be 1,000 years. Decomposing is a problem. The efficiency of dust arresting plants was, in ascending order: non-mechanical type, such as the water trough; centrifugal or multi-vortex type; gas washing; and electrostatic precipitation. The chimney height affects the area which comes into the range of deposition.

67-0569

Baum, F., and W. Steinbach. The problem of waste incineration in small incinerators. Staub, 27(7):318-20, 1967.

Emissions from small incinerators have not yet been measured and no regulations as to emission limits have yet been worked out. To blaze the trail in this respect a small incinerator for a doctor's office has been treated. The incinerator had a volume of 45 liters. The combustion chamber was walled in by steel bars followed by a heat resistant sheet steel wall, serving for heat insulation, and an enameled sheet steel wall. Between the steel bars and the sheet steel wall electrical heating elements of 220 volts, 3 kw, controlled by a thermostat, were arranged on the front side. For the test the incinerator was loaded with waste paper. The temperatures in the smoke pipe fluctuated between 100 C (before loading) and 150 C

(after loading). The measured CO and CO2 concentrations were considerably lower than those obtained from medium-sized incinerators. Moreover, the emission of dust particles was measured with a 'Stroehlein' filter. The results lay between 300 and 425 mg per cu m. Closer investigations showed, however, that large amounts of hydrocarbons had settled on the filters falsifying the measurement of the dust particle emission. Although the VDI (Association of German Engineers) Recommendation 2301 regarding dust emission is fulfilled, the emission of hydrocarbons poses a nuisance. A thermal afterburner is required to eliminate the odors arising through incomplete incineration. Moreover, it is recommended that test instructions for small incinerators as well as regulations similar to those valid for oil heaters be formulated.
(Text-German)

67-0570
Bender, R. J. Incinerator plant-plus. Power, 111(1):62-64, 1967.

An incinerator for household refuse, which also generates steam for heating and electricity in the summer, and is located at Issy-les-Moulineaux, a Paris suburb, is described. The plant has a normal capacity of 400,000 tons of refuse a year, with a peak of 500,000 tons a year (57 tons an hour). A half-section drawing shows the complete plant operation from unloading, through storage, incineration in the boiler, dust collection in the electrostatic precipitators, to the flyash and clinker storage. The steam at a pressure of 928 psi and a temperature of 770 F is passed through a back-pressure turbine (290 psi) which drives a 9,000-kw generator all year. In the winter, the steam from the back-pressure turbine passes through an expander superheater with a capacity of 285,000 lb per hr and is used for city heating. In the summer, steam from the back-pressure turbine passes through a condensing turbine to provide an additional 15,000 kw for the Electricite de France network. The refuse has a heat value which ranges from 1,600 to 4,500 Btu per lb, typical of today's household garbage which varies in quantity and nature with the season. The presence of polyvinyl chloride plastic in discarded packaging material produced a corrosion problem along the lower parts of the furnace walls from nascent chlorine which has been cured by applying gunite to the lower sidewalls. Atmospheric pollution is practically nil with no plume of smoke from the 260 ft stacks, no dust, and no odor.

67-0571
Bockenmuehl, W. Incineration of composting residues and bulky waste on a tilt step grate. Brennstoff-Waerme-Kraft, 19(10):494-496, 1967.

The performance of an incinerator with a tilted step grate was tested. The incinerator was designed for a capacity of 1,000 kg per hr. The grate consisted of 14 steps; four steps served for drying. The grate was more inclined in the drying zone than in the combustion zone. The test lasted for 6 hr and consisted of three experiments. In experiment 1, which lasted 60 minutes, bulky waste was supplied to the incinerator. In experiment 2, which extended over a period of 2 hr, the incinerator was loaded with manually selected waste and bulky waste. In experiment 3, which lasted 3 hr, composting residues were burned. Experimental conditions such as temperature, composition of the flue gas, and air pressure are listed. The designed capacity of 1,000 kg per hr was easily reached. The measured capacity was 1,225 kg per hr for manually selected waste, 1,030 kg per hr for composting residues and 1,225 kg per hr for bulky waste.
(Text-German)

67-0572
Brancato, B. The incineration of urban solid refuse in the Milan plant. Fumi Polveri, 7(4):70-78, 1967.

The plant consists of a pit where refuse is placed, a bridging van to feed the furnace, a furnace, heaters, filters, a chimney, water purifiers, a central station for electricity, and heat exchangers. The composition of solid refuse varies according to the locale. The elementary composition of the Milanese refuse is carbon—56 percent, hydrogen—5 percent, oxygen—36 percent, and nitrogen—3 percent. The Milan plant burns up to 600 tons per day, and the heat produced is utilized to produce electrical energy by means of a 9,200 kva generator. The hot vapor products could be used for industrial heating. Smoke particles are removed by the use of suitable electrostatic precipitators. Muddy and dirty water is purified by pumping the water to a cement basin placed beneath the cooling system. A flocculation apparatus is placed in this basin which purifies the water by means of chemical reagents. The cost of the plant is 5.8 million Italian lire for the tons of the refuse treated per day. The cost per ton is between 1,460 and 1,340 lire which is less than the 1,550 lire it costs to operate other plants. (Text-Italian)

67-0573

Briosi, G. L. Rubbish incineration with heat recovery for use in urban heating. Fumi Polveri, 7(6/7):148-154, 1967.

The burning of rubbish should be utilized as a heat source for heating buildings, for producing hot water and steam, and for producing electrical energy. Rubbish contains 'combustible materials', 'inert materials', and water'. In order to calculate the caloric content in kcal per kg, the cellulose composition, 6 carbons to 10 hydrogen to 5 oxygen, can be used as an approximate composition for the 'combustible materials'. The percent composition of rubbish and its caloric content for a given locale is tabulated. Both the average caloric content and the percent humidity are plotted for each month of the year. The results indicate that the average caloric content is highest in winter and lowest in summer, while the opposite is true for the percent humidity. The caloric content of rubbish is tabulated for the winter and summer seasons for various European cities. Knowing the caloric content and the percent composition of the rubbish for a given city, it should be possible to utilize incineration as a source for heating. If the caloric content is not sufficient, supplementary sources could be used when needed. (Text-Italian)

67-0574

Britain's largest incinerator. Public Cleansing, 57(6):299-306, 1967.

Two contracts for mechanical and electrical equipment worth £5¾ million for the construction of GLC's Deephams Works largest incinerator are discussed. This plant could cope with 700 vehicle loads a day and produce electricity with an income of £½ million per year. The boiler plant which is being designed by Yarrow and Co. Ltd. will supply the reception facilities for refuse, incineration grate, steam raising unit, and residuals handling unit. Each of the five boilers is capable of burning out completely 14 tons per hr and producing steam at 625 psig and 850 F. Automation will reduce labor for handling unhygienic rubbish to a minimum. The power generator plant is being handled by Associated Electrical Industries Limited who will supply the 12.5 MW turbine-generators, 2.5 MW turbine-generators, turbine and steam control system, electrical equipment and the ancillary plant.

67-0575

The burning tire question. Waste Trade World, 111(23):19, 1967.

A report, written in response to recent recommendations made by the Rubber and Plastics Research Assoc., that the British Government should spend £3,000,000 on the erection of incinerators for burning tires, is summarized. The authors, Mr. R. Tennant and Mr. W. Klein, feel that concerned governments must realize that it is criminal to destroy valuable material which may, in time of need, be required to maintain the balance of the economy. The unpleasant chain reactions which they visualize if the Government decides to build incinerators are briefly described. On removal, tires still retain about 75 to 80 percent of their original manufacturing value so that they are still very much a commercial commodity. Used tires are traditionally sorted into five categories: retreadable tire casings; repairable tires; tires suitable for export; export of retreaded tires; and total scrap tires which are passed to the reclaiming industries. All these categories not only contribute to the national economy, but they also keep large industries employed. The retreading industry, export, and the reclaiming industry are described as examples. If all tires removed from vehicles are burned indiscriminately, the production of new tires would increase considerably but the retreaders and all associated industries would be out of business. The merchants should be the ones to decide on the number of tires to be destroyed, reclaimed, or stored in dumps under Government sponsorship for use during a shortage of raw and reclaimed rubber.

67-0576

The cleaning of gas ducts in boilers. Sanitaer und Heizungstechnik, 32(12):930, 1967.

Soot and slag, which cause corrosion, are deposited along the walls of flue gas ducts. These ducts must be regularly cleaned out and a steel brush mounted on a long rod is most commonly used for this purpose. It is pushed through the dirty tubes by two or three men. Since this method is very strenuous, a new cleaning unit called 'Soot Vac' has been developed for the job. An electric motor pushes a steel band with a steel brush mounted at the end through the ducts. The soot is sucked into an orifice which is tightly sealed so that dust cannot escape. The suction mechanism works according to the cyclone principle in connection with a filter. The soot container has a volume of 100 liters and is lined with a paper bag which, when full, is exchanged for an empty one. The unit can be adjusted to any tube diameter by variations in brush size. (Text-German)

67-0577

Combination coal/paper stove. Sanitaer und Heizungstechnik, 32(3):246, 1967.

A combination coal/paper stove is introduced by the iron plant, Burger, in West Germany. It has a special combustion cylinder for burning waste paper. When the stove is fired with coal, the combustion cylinder serves as an ash container. A photograph of the stove is given. (Text-German)

67-0578

Continuous automated incinerator. Royal Society of Health Journal, 87(1):43, 1967.

The contract has been let by the Derby Corporation for the first continuous fully automated incinerator in the United Kingdom which it is hoped will be in operation by early 1969 as a permanent solution to the waste disposal problem now that sites for sanitary landfill are becoming scarce. The refuse collection vehicles will discharge crude refuse into the reception pit, from which a grab crane feeds the furnace hopper with the refuse dropping through a chute into the primary stoker and then to the second furnace. Ashes and grate riddlings fall to hoppers below and then are conveyed to special vehicles for dumping. Animal carcasses and other offensive material are burned separately. Cans and other noncombustibles are removed from the pit for dumping. An induced-draft fan discharges exhaust gases to the steel stack. The grate strand contains 2,722 independent pivoted fire bars which incline toward the center of the furnace and then overbalance to pass underneath in a vertical position. The fire bars are agitated by skid bars so that they automatically free themselves of any matter which accumulates. Broken bars are deposited in a safe position and the others incline further to fill the gap. It is possible to repair bars safely while the machine is running. The plant is designed to provide the cleanest possible working conditions for the four men required to run the incinerator.

67-0579

Continuous incineration will produce power at GLC Deephams works. Steam and Heating Engineer, 36(429):12-16, 1967.

The Deephams works of the Greater London Council, which will be the largest refuse disposal plant employing continuous incineration, is scheduled for completion in 1970 at a cost of £9 million. The works, able to cope with up to 700 vehicles a day, are expected to produce power to generate electricity for sale. Earnings of about £500,000 per annum are anticipated. Output is expected to be between 27 MW and 40 MW, according to the heat value of the refuse. Deephams will have a normal continuous throughput of 1,333 tons per 24 hr of crude refuse, and a peak of 1,667 tons. The plant will consist of five steam-raising units, four operating and one standby, fueled by domestic, commercial, and trade refuse by grab crane from collecting bunkers. It will produce, as a residual by-product, scrap metal and commercial grades of ashes. Automation will reduce labor for handling unhygienic rubbish to a minimum. Particular attention was given to preventing the emission of dust and odors from the plant. The reception facilities, incinerator grate, steam-raising unit and residuals handling plant are described in detail, and the arrangement of the plant is schematically illustrated. The power from four 12.5 MW steam turbine generators will be exported to the Eastern Electricity Board. Two 2.5 MW turbine generator house sets will supply the power station auxiliaries and the electrical requirements of the refuse plant. The turbine generators, turbine and steam-control system, electrical equipment and ancillary plant are described.

67-0580

Continuous municipal incineration plant. Steam and Heating Engineering, 36(424):7-13, 1967.

The description of the first automated incineration installation for a municipality which is being built for the County Borough of Derby includes sketches of the overall layout and the stoker. The incinerator to be built on an island in the River Derwent will have a daily throughput of 210 tons of crude refuse from a population of 132,000. The design is based on an 'L' type traveling stoker widely used for low grade fuels. The manufacturer guarantees a residue with less than 3 percent organic matter. Facilities are provided for sorting, pressing, and storing separately collected waste paper. The self-cleaning facility of the stoker is important to prevent the fouling of air spaces with putrescible materials. Owing to the highly volatile nature of the refuse, secondary air is important. The plant is scheduled to come into operation in 1968 when the dumping areas will be filled and will provide a permanent solution to the 46,000 tons of domestic and trade waste produced by the Borough of Derby, England.

67-0581

Czajkowski, M., and Gurowski, Z. Experiences with the combustion of city trash and bituminous coal slurry in the WLM 2.5/2 incinerator. Gaz, Woda I Technike Sanitarna, 39(2):62-64, 1967.

Experiments are reported on the combustion of city trash and bituminous coal slurry in the WLM 2.5/2 incinerator. This incinerator was utilized in such a way that garbage made up 17.5 percent of the combined waste products consumed, leading to a fairly constant development of 5,026 kcal per kg. Using 1 part of trash, and 1, 2, 3, 4, or 5 parts of coal slurry (grain size 0-2 mm), heat production was measured and parameters such as cost of raw materials and transportation were determined for all mixtures. Even though more coal is used, ratios of 1 to 4 and 1 to 5 were found to be the most economical, especially when the furnace is operated at 70 percent capacity. Under these conditions, ash is 12 to 20 percent, and there is no difficulty in steaming the furnace at atmospheric temperatures as low as -2 C. (Text-Polish)

67-0582

Dvirka, M., and A. B. Zanft. Another look at European incinerator practices. Public Works, 98(7):99-100, 1967.

A study of incinerator plants at Dusseldorf, Rotterdam, Paris, and Vienna is described. Data were gathered on design, operating practices, characteristics of refuse and residue, performance, and cost. Selected data on the plants are tabulated. Each of the plants presents characteristics more typical of power plants than incinerators. A relatively high percentage of down-time is reported. The pros and cons of waste heat utilization are discussed. The plants are located in relatively densely populated areas, but their presence is not objectionable due to sophistication of the layout and design of facilities, which incorporate features to eliminate offensive odors. The general design and operation of the plants are described in detail and the effectiveness and durability of their electrostatic precipitators is stressed. The quality of the refuse from Dusseldorf, Rotterdam, Paris, and Vienna is tabulated. Although some new and interesting features appear in the latest European incineration practices, the picture has to be studied on a broader scale, bearing in mind that what is feasible and useful in the European economy does not always apply to the economic situation in the United States.

67-0583

English refuse incinerator generates power. Public Works, 98(8):180, 1967.

The first United Kingdom incinerator, designed for continuous burning of refuse and also for generation of power, is now under construction at Deephams. It will serve eight different authorities in the Greater London Council's area. The estimated normal flow of refuse to the plant is 1,333 tons per day, with a maximum of 1,680 tons. Reception facilities will handle up to 700 vehicle loads per day. The weigh bridges will be computer controlled and will direct the vehicle to one of the 23 unloading bays serving five refuse storage bunkers. Power production is estimated at 30 MW.

67-0584

Fabian, H., and H. O. Weber. The new waste incinerator plant at Farbenfabriken Bayer, Leverkusen, Germany. Brennstoff-Waerme-Kraft, 19(10):484-486, 1967.

The company's plant in Leverkusen, Germany, has an annual accumulation of 500,000 cu m of waste suitable for dumping and 40,000 tons of solid, pasty, and liquid wastes which must be incinerated. The new incinerator began operation in June of 1967. The investment costs amounted to 18 million DM. The operating costs are estimated to run at 200,000 DM per year. The solid waste is brought to the rotating tube furnace with the aid of a crane; bulky waste is crushed first. The material remains in the furnace for 30 minutes at a temperature of 1,200 C which reduces the volume to one-twentieth of the original amount. The liquid slag falls into a water trough, is cooled and deposited. No odors can develop at this high incineration temperature. The flue gases are thoroughly cleaned before they escape into the air. The liquid wastes, mostly solvents or waste oils, are pumped to 13 burners located in the rotating tube furnace. Each burner is equipped with a flame-control device which stops the oil flow automatically as soon as trouble develops. Chloride-containing liquids are separately delivered to the incinerator plant and are burned in a muffle furnace at a temperature of 1,200 C. The chloride compounds are converted to hydrochloric acid which is washed out according to the counterflow principle. In this process the temperature of the flue gases is reduced to below 100 C so that no heat utilization is possible. For cardboard reels, containers, and barrels with solid or liquid contents which cannot be mixed with each other, a multi-purpose furnace is available. The entire plant is staffed by 36 persons. Various illustrations of the plant are given. (Text-German)

67-0585

Gas-fired incinerator has 'burn anything' capacity. Gas Journal, 332(5429):216, 1967.

A new type of gas-fired incinerator with a 'burn anything' capacity, introduced by the Silent Glow Company of Shipley, Yorks, is described. It can deal with loads up to 150 lb, yet requires only a small space for installation. Speedy, efficient destruction is ensured by the gas-fired burner jet, which generates 80,000 Btu per hr. The main body of the incinerator, cylindrical in shape, is made from 1/8 in. steel plate. Overall height is just over 4 ft, width 2 ft, giving an effective combustion space of 9½ cu ft with further space available for ash. Fitting of a special 'runner' pilot igniter assembly makes it possible to light the incinerator from outside the casing. If the burner flame is extinguished, a completely automatic gas control system turns off the main gas supply. Gas supply to the pilot light, however, is unaffected, allowing the main jet to be easily relit. All mechanisms are enclosed, away from possible damage, in a metal control box attached to the main body of the heater. A time delay switch is mounted on the body, allowing the incinerator to be set in operation for known lengths of time. The price is £182 10s.

67-0586

Geneva's river musketeers. Public Cleansing, 57(4):182-186, 1967.

The incineration plant at Cheneviers can handle 400 tons per day with 24-hr operation. A unique feature is that the plant is supplied wholly by river barge. The journey downstream to the plant takes 50 minutes. The barge is withdrawn from the water to a position alongside the refuse storage bunker to avoid polluting the river during unloading. Refuse is transferred from the barge to the banker by a grab.

67-0587

GLC's Deephams refuse disposal plant. Surveyor and Municipal Engineer, 129(3908):60-63, 1967.

A progress report on the Greater London Council's £9 million refuse plant at the Deepham Works at Enfield indicates that the contracts have been awarded for the £3,356,000 boiler plant and the £2,353,000 turbine plant. The five boilers are each capable of burning 14 tons of refuse an hour and producing steam at 625 lb per sq in. and 840 F. The maximum output of each unit is 86,000 lb of steam per hr and total output is 30 MW. The plant will be fueled with domestic, commercial, and industrial refuse by grab crane from collection bunkers, and producing as a residual by-product, scrap metal and commercial grades of ashes. Automation will reduce the handling of unhygienic waste to a minimum and special attention has been given to the control of dust and odor emission. Because of the variations in the calorific value of the fuel, the turbine and steam control system will maintain substantially constant pressure in the steam lines without regulation of the boiler firing rate. Progress is being made in the construction of the Deephams refuse disposal plant which is programmed for completion in 1970.

67-0588

Granz, P. Sanitary problems of the city of Leverkusen. Staedtehygiene, 18(5):105-107, 1967.

Since 1945, the population of the city of Leverkusen, West Germany, has increased by 100 percent. Due to this enormous growth the city has been confronted with a number of problems. There are new apartment houses to be built, new sources of drinking water to be found, drainage systems to be laid and last but not least, the city sees herself confronted with the inescapable necessity of building a waste incinerator plant. Three hundred kilograms of waste per inhabitant annually had to go to one public dumping site which has been filled to capacity since 1966. A dumping site is now shared with the neighboring city of Opladen. The incinerator plant is to go into operation in the year 1969. Two furnaces will burn 240 tons of waste each per 24 hr. The plant will be located near the center of the city and will supply remote heating. (Text-German)

67-0589

Hammann, W. G. Incinerator for liquid and gaseous waste material in a medium-sized chemical plant. Brennstoff-Waerme-Kraft, 19(10):481-483, 1967.

In a chemical plant producing dyes and pharmaceutical products, an incinerator was built which burns 400 kg of solvents and 100 cu m of waste gases hourly. The waste is collected in barrels with a capacity of 200 to 400 liters and brought to the incinerator plant. Before emptying the barrels into storage tanks, their contents are checked as to chloride content, which may not exceed 5 percent by weight, sulphur content (maximum 5% by weight), water content (maximum 20%), and the pH factor (about 7). The waste material is pumped from the storage tank to the burners. The waste gases are pumped through plastic pipes to the burners without intermediate storage. The burners are shaped in the form of a tube (diameter 750 mm). The inner tube rotates (about 3,000 rpm) and atomizes the liquid waste material. The waste gas and reused air are emitted through a ring arranged around a tube of fresh air. Each burner has an additional oil burner to aid the incineration. The facility is equipped with the usual protective devices. The waste gases escape through a chimney which is 70 m high. The flue gases are cooled down to a temperature of 210 C, and the available heat is used to produce steam. Illustrations of the plant are given. (Text-German)

67-0590

Harmsen, H. The waste incinerator plant of Farbenfabriken Bayer AG in Leverkusen, Germany. Staedtehygiene, 18(12):290-292, 1967.

In a chemical plant of the size of the Farbenfabriken Bayer in Leverkusen, great amounts of combustible and incombustible wastes of all kinds accumulate. 500,000 cu m of incombustible waste material has to be dumped annually and this amount will increase further; 40,000 cu m of various waste material is incinerated annually. A special furnace is required for this purpose because the waste comes not only in the solid state, but in pasty and liquid states too, which have higher heating value and develop soot, smoke and odors when incinerated. In 1960, an experimental plant was erected. In 1964, construction work on the proper plant began. The core of the plant is a rotating tube furnace with a length of 12 m and a diameter of 3 m. The waste material remains in the furnace about 20 minutes at a temperature of 1,200 C. The incineration reduces the volume to one-twentieth of the original amount. The liquid slag falls into a water trough, is cooled, and can be deposited. During incineration, about 60,000 cu m per hr of flue gases are produced which have to pass a system of combustion chambers so that the odors are destroyed. Below the combustion chambers there is a funnel collecting the fly ash. The gases are subsequently cooled down to about 300 C and cleaned once more. The heat obtained is used to produce steam. The gases escape through a chimney 100 m in height. The liquid waste is pumped to the 13 burners. Chloride-containing liquid waste material is separately delivered and incinerated in a muffle furnace. Sulphur-containing acids are shipped to the North Sea and emptied into the water. The waste incinerator plant, built within 20 months, consumed 13 million DM of investment costs. The steam, approximately 25 ton per hr, 24 atmospheres at 400 C, does not cover the operating costs. In fact, an additional 2 million DM must be raised annually to cover them. (Text-German)

67-0591

Heenan-Nichols continuous incinerator. Public Cleansing, 57(6):313-316, 1967.

A continuous incinerator constructed by Heenan and Froude Ltd., Worcester, is being operated at their own expense as a pilot plant; the cost totals over £70,000. The plant will demonstrate the satisfactory incineration of refuse on this particular pattern of grate. Research will be conducted when burning various types of refuse, and a thorough research and development program will be completed. The plant can burn up to 7 to 8 tons per hr with a minimum rate of 5 tons per hr. The Borough of Sutton Coldfield has a contract with Heenan and Froude Ltd. worth £340,000 for a plant with a capacity of 10 tons per hr.

67-0592

Hirsch, M., and R. Rasch. Corrosion in waste incinerators. Brennstoff-Waerme-Kraft, 19(10):498-499, 1967.

Two brief reports given at the VGT/DECHEMA meeting held in 1966 in Stuttgart are reprinted. Possible causes for corrosion occurring in waste incinerators are discussed. The HCl concentration was found to be higher in flue gases of waste incinerators than in flue gases of furnaces heated with coal, so that a corrosion at the heat exchanger surface must be expected. To reduce corrosion, an exact knowledge of the influences is necessary. This is achieved by theoretically obtaining the thermodynamic conditions and comparing them to the experimentally obtained data, by laboratory experiments and by experiments with the incinerator itself. Since corrosion is reduced on bare surfaces according to Steller, the use of such additives as aluminum oxide or silica are helpful. The binding of hydrogen chloride to calcium oxide has also a corrosion-reducing effect. But these additives are useful only at temperatures below 400 C. When iron oxide of the heat exchanger surfaces reacts with the chloride compounds in the flue gases, iron chloride is formed, which decomposes easily. The chemical reactions of ferrous oxide and ferric oxide with 4 and 6 moles of hydrogen chloride in an oxidizing and reducing atmosphere are given. The reasons for the smaller amounts of corrosion in bare pipes are discussed. (Text-German)

67-0593

Incineration of domestic refuse. Public Cleansing, 57(2):80-83, 1967.

In America, on-site incineration solved the problem of ever-increasing volumes of refuse, but caused air pollution. Research began to develop smoke-free, odorless incinerators. The Refumatic incinerator at Wolverton, England, reaped the benefits of the research. A water wash by a parasol spray at the flue off-take washed out fly ash, and another spray at the bottom was used as a safety measure. A new feature is a purge cycle to work at night. At Wolverton, there is a refuse hopper on each floor with a special seal to protect the user from the hot products and to prevent entrance of large articles that would cause chute blockage. Early tests showed that incinerators, smaller than American types, could be used at Doncaster. These were filled with a flexible control system to rearrange the fixing program. The smoke emission of this plant was less than Ringelman 1, which showed a malfunction since there was to be no emission at all. After modifications, however, it dropped to less than 5 percent (Ringelman 1 equals 20 percent). Additional combustion air promotes a faster rate of combustion. Tests showed that the volume of refuse from 300 flats using the incinerator for a 10-day period was 2,130 lb per week or 7 lb per week per person. The reduction volume at Wolverton was 5 to 1 including tins and 8 to 1 without tins, and at Westminster 7½ to 1 (with) and 10 to 1 (without). These tests resulted in technical information to improve existing and planned installations.

67-0594

Incineration recommended for Tyneside/Wearside regional disposal scheme. Public Cleansing, 57(7):387-390, 1967.

A report read at a joint meeting of the North Regional Planning Commitee and the Cleansing Committee in the Tyneside/Wearside area, held in February 1966, concluded that regional cooperation in refuse disposal was necessary, and urgent. An Operational Research Unit was engaged to prepare proposals for the development of regional refuse disposal, but as a first, short-term step, working parties were asked to make outlets for refuse available, until at least 1972-1973. The report of the Research Unit recommended using a system other than controlled tipping and felt that the ultimate decision as to the location of long-term disposal methods should not be made on financial grounds only. Based upon a computer study of the problem, the Research Unit recommended the use of five incinerator plants or six pulverizers. On the basis of this report the Steering Committee unanimously recommended incineration as the future method for most of Tyneside/Wearside and provided for the administration of the recommended plan. Estimated capital cost is about £4 million for six incinerators, with estimated capacity of 2,050 tons per day altogether.

67-0595

Incinerator for sewage sludge. Engineer, 224(5823):296, 1967.

A multiple-hearth pilot plant incinerator for sewage sludge developed by Ashmore, Benson, Pease & Co. has been installed at the Dartford Works of the West Kent Sewage Board. A picture and description of the plant is given. The multiple-hearth incinerator combustion is normally autothermic and is designed to give an odorless and economic method for the total destruction of sludge. The sludge, dewatered to 20 to 25 percent moisture, is fed into the top by a belt conveyor and a sealed feeder. The incinerator is made of a cylindrical refractory-lined shell with a number of self-supporting refractory hearths arranged one above the other. An air-cooled shaft extends through the unit which operates rabble arms with rakes which move the sludge in a spiral path on each successive hearth so that it moves in and out and drops through alternate holes which are near the periphery on one hearth and near the center on the next hearth and so on through the various hearths. The odor is destroyed by the high temperatures in the incinerator. A small amount of sterile ash, which can be used as landfill, is discharged at the bottom of the furnace. The weight reduction in the furnace is claimed to be 97.5 percent. The combustion products are pre-cooled before wet scrubbing. The final gaseous effluent contains less than 0.1 lb of flyash per 1,000 lb of gas. The manufacturer believes that this process has considerable promise in disposing of sludge without creating an odor or dumping problem.

67-0596
Incinerator plant for industrial production residues. Wasser Luft und Betrieb, 11(10):593-594, 1967.

An incinerator plant at the Bayer color fabrication plant in Leverkusen, Germany, which is tailored to the type of refuse produced by the plant, is described. This factory produces 500,000 cu m refuse a year and anticipates an additional 150,000 cu m yearly from sewage purification. The incineration process of the solid material is described. At an incineration temperature of 1,200 C, the refuse is burned completely within 30 minutes, and the volume is reduced to one-twentieth. The flue gases, which amount to about 60,000 cu m per hr are first subjected to a rough purification by means of a series of funnels under the combustion chamber. The gases are then cooled to 450 C in a waste heat boiler, a process which produces steam that can be utilized in the operation of the plant. After further cooling to 300 C, the gases are purified in an electrostatic gas purification unit; when they contain less than 150 mg per m dust they are emitted into the atmosphere. The liquid waste, which consists mainly of solvents and waste oil, is vaporized in a special burner and then completely burned in a combustion chamber. Each burner is equipped with a safety device, which cuts off the flow of oil when trouble develops. Chlorine-containing liquid wastes are delivered separately and burned completely at 1,200 C. After washing to remove HCl, the gases are cooled to below 100 C, passed through a wet-electrofilter, mixed with the other gases, and emitted into the atmosphere. Cost of the incinerator plant was 18 million DM, and yearly operating costs are roughly 2 million DM. (Text-German)

67-0597
Incinerator uses trash as fuel to produce electricity in Rotterdam. Refuse Removal Journal, 10(11):6-7, 32, 1967.

The design and operation of an incinerator in Rotterdam, Holland, which uses refuse as fuel to generate steam for the production of electricity, is described. The incinerator incorporates four furnaces arranged in two symmetrical pairs. Last year it produced a little over 80 million kilowatt hr, used 8 percent of it for its own purposes, and sold the remainder. Revenue from the sale did not cover the cost of production. The incinerator is operated by an organization known by its initials as Roteb, which in translation stands for sanitation, disinfection, transport, and fire service. Eighty canal barges, some of which have a capacity of 235 cu yd, transport about two-thirds of the refuse from transfer stations to the incinerator; the remaining one-third is collected by trucks. The cost of the incinerator was $10 million and it is expected to have a useful life of 30 to 40 years. A new installation is scheduled to start early next year and should be completed by 1970. It will have six furnaces, burning 20 tons of general-type refuse per hour, plus three furnaces to handle special wastes such as toxic substances or materials which melt at low temperatures. The total capacity will be about 550,000 tons a year. The investment required for building the new plant is estimated at $28 million, and the installation must pay for itself. While the future incinerator will also generate electricity for sale, it will incorporate an additional feature—the distillation of water for industrial use.

67-0598
Incitherm waste incinerator. Sanitaer und Heizungstechnik, 32(3):241-242, 1967.

The Incitherm waste incinerator is of sturdy construction. It has double steel walls of 8 mm thickness each and an automatic poker. It dumps its ash directly into trash cans. Since it is water-cooled it is able to operate continuously for many hours. (Text-German)

67-0599
Ingenuity and incinerators. Environmental Science and Technology, 1(8):604-605, 1967.

Although refuse incinerators developed for operation in West Germany have utilized some high-grade and ingenious technology for their special needs and operate with plumeless stacks, these designs cannot be utilized exactly in the United States, although some of their innovations may be useful. The economics are different in the United States where Consolidated Edison may pay $5.00 a ton for coal in New York compared to $20.00 a ton for coal in Munich. In West Berlin, a sintering plant for the incinerator plant residue is economical because West Berlin has no accessible countryside to furnish aggregate, but such a plant would not be economical in the United States. The economics of refuse incineration in the United States may change so that the state of the art may catch up with that of West Germany, especially with more stringent U.S. air pollution regulations. If the incinerator requires an electrostatic precipitator because of air pollution requirements then the air must be cooled and the heat reclaimed for heating purposes. Until now it has been cheaper to waste heat from incinerators than to recover it. A photograph is shown of an efficiently working incinerator stack with no white plume. This information was obtained by Mr. Leo Weaver, chairman of a panel set up under the United States-German Cooperative Program in Natural Resources, Pollution Control and Urban Development, who indicated also that the German innovations that should be applied in the United States included: grate design, grate manufacture, ash handling equipment, and air pollution control equipment. The panel is recommending that a mechanical engineer be sent to Germany for an extensive study of incinerator design.

67-0600

Kercher, H. Dust removal from flue gas. Brennstoff-Waerme-Kraft, 19(4):196-197, 1967.

A progress report in the area of dust removal from flue gas is presented. Thirty-seven papers published in 1966 are listed and characterized as belonging to one of the following topics: mechanical dust removal, wet dust removal, fabric filters, and electrofilters. (Text-German)

67-0601

London to generate power from refuse. American City, 82(5):52, 1967.

The Greater London Council recently ordered construction of the first major plant in the United Kingdom to generate power from refuse incineration. The Deephams Refuse Disposal Plant, scheduled for completion in 1970, will have a capacity of 1,333 tons of refuse per day, and will cost an estimated £9 million ($25.2 million). The contract for the generators came to £2.5 million ($7 million). Steam generated in five boilers will be used to drive six generators. Four direct-coupled turbine generators, each having a capacity of 12,500 kw, will serve as the baseload generating plant operating throughout the week. Two 2,500 kw gear-driven generators will be used to provide power for in-house equipment. Electrical power not used at the plant will be 'exported' to the Eastern Electricity Board.

67-0602

Meier, E. Dust filters and cyclones. Chemie-Ingenieur Technik, 39(23):1324-1326, 1967.

New and improved dust filters and cyclones made by German companies are described. Sixteen companies are listed, and their new products described, including wet cyclones, bag filters, a combination filter cyclone, an electro-filter, a hot gas cyclone especially suitable for the cement industry, and spray filters. Some illustrations are given. (Text-German)

67-0603

Multiple hearth furnace incinerator. Water and Waste Treatment, 11(10):452, 1967.

A sewage sludge incineration pilot plant, installed by Ashmore, Benson, Pease & Co. Ltd. at their Dartford Works, is described. The plant consists of a Multiple Hearth Furnace of the Nichols Herreshof type, and an exhaust gas cleaning system. The furnace consists of a vertical cylindrical shell lined with a castable refractory which encloses a number of circular horizontal hearths. The first two hearths are used for pre-drying the sludge, the second two for incineration, and the third two for ash cooling. Heat for bringing the furnace up to operating temperature is supplied by gas burners, using digester gas as fuel. The exhaust gases are pre-cooled and then scrubbed to remove fine particles of ash before being discharged to atmosphere. Recent tests at the plant have shown the system to have an average capacity of 225 lb per hr when fed with a mixture of primary-digested plus heat-treated activated sludge containing 66 percent moisture. The sludge burned without the use of auxiliary fuel and no odors were detectable during normal operation. The total average quantity of ash collected from the furnace base and the hydrocyclone effluent was 30 lb per hr giving a weight reduction of about 87 percent of the total feed. The scrubber was working on recycle and the average flow from the hydrocyclone was 110 gal per hr.

67-0604

New refuse disposal plant for Ayr. Public Cleansing, 57(11):594, 1967.

A new Heenan & Froude refuse incineration plant for the Royal Burgh of Ayr was placed in operation on September 13, 1967. The plant is designed to deal with 140 tons of crude domestic refuse in an 8-hr day and a separate small incinerator will burn 5 tons of trade waste in the same period. The two 80-cu-yd redeption hoppers are designed to handle low-density refuse without choking or the use of a regulating device. After passing screen and salvaging processes, the tailings are burned in the main incinerator consisting of eight Heenan mechanical type cells, arranged in two units, with hydraulically operated grates. Combustion gases pass through flues to a water-trough type dust-catcher. The 150 ft high circular brick chimney has an internal diameter of 9 ft and is refractory lined throughout. Clinker is automatically discharged into stillage-type skips in enclosed chambers, where it is quenched by water sprays. Included in the plant are a Heenan Super Hydraulic tin baler and a new wastepaper baling plant with Powell Mk IV horizontal continuous baler and a non-reversing Wedco woven wire type conveyor. The original contract figure amounted to Ŀ330,892, but this was later increased due to adjustments in the design.

67-0605

New waste incinerator plant. Staub, 27(10):466, 1967.

A new waste incinerator has been put into operation at Farbenfabriken Bayer, Leverkusen, Germany. The costs of the new plant amounted to about 18 million DM. The incinerator has a capacity of 100 tons per day. The operation of the new plant is described in detail and schematically illustrated. (Text-German)

67-0606

Nowak, F. Experiences with the waste incinerator in Stuttgart. Brennstoff-Waerme-Kraft, 19(2):71-76, 1967.

A waste incinerator for 150,000 ton per year has been in operation in Stuttgart for the last 1½ years. The heat content of the waste varies between 1,200 and 1,600 kcal per kg. Severe problems were storage of the waste prior to burning and cleaning and corrosion of the waste-burning chamber. For the latter, reducing flames and gases seem to be responsible. Operating time between cleanings was 8 weeks at the most. Dust in the flue gas could be kept below the legal limit of 150 mg per cu m by means of electrofilters. Magnetic collectors removed iron from the slags. Combustible residues in the slag were below 4.5 percent. The temperature could be kept between the limits of 800 and 1,100 C. Conclusions for the planning of future incinerators are drawn: the tubes in the combustion chamber should be spaced at least 120 mm apart to allow easy cleaning; and coatings to prevent corrosion are suggested. (Text-German)

67-0607

Ochs, H. J. Problems in refuse incineration. Wasser Luft und Betrieb, 11(10):588-590, 1967.

The tasks of an incinerator plant are mainly reduction of refuse volume, prevention of water pollution, odors, gas formation, and vermin, and conversion of refuse to ashes. Since refuse is a very difficult substance for incineration, an analysis was conducted of household refuse and industrial refuse and the results tabulated. Provisions for drying the refuse before incineration are necessary, since it is of utmost importance that the incineration temperature does not fall below 150 C, as below this temperature the fire may be extinguished.

To ignite the dried refuse, addition of heat is necessary until the temperature reaches 250 C, at which point the process becomes exothermic. However, addition of a carefully regulated hot air stream is desirable to bring the temperature quickly above 800 C, ideally to 1,000 C. The type of grate used in the design of the plant is also of importance. Tabulated data show various types of grates most commonly used and the construction features and corresponding work methods in incineration processes. Experience has shown that waste-heat utilization is only economically feasible in large incinerator installations. (Text-German)

67-0608

Orders for waste incinerators in the year 1966. Schweizerische Bauzeitung, 85(33):620, 1967.

Quite a number of municipalities have to decide in favor of incineration to eliminate the ever increasing amount of waste, despite the high costs involved. This is confirmed by the number of orders received by the Von Roll company in 1966. A table lists the cities, the number of incinerators, and the capacity of the furnaces ordered. To partly cover the high investment in the cost of incineration, heat is utilized to the best advantage. (Text-German)

67-0609

Osterath, R. F. Cranes for refuse incineration plants. Foerdern Heben, 17(5):275-278, 1967.

In the process of waste incineration, cranes are used to load the furnaces, and to mix and store the accumulating waste. The type of crane chosen in each individual case depends very much on the amount and type of waste to be dealt with. City waste, for instance, tends to mat during storage, which increases its specific weight and decreases its compressibility. A crane with a multi-shell grab proved to be better suited for this kind of waste. With its flexible, finger-like, and pointed shells it is able to grab more waste than the crane with a two-shell grab. The latter crane is very well suited to grab grain, coal, gravel, as well as all fine-to medium-grained material. Two numerical examples show that if a crane with a two-shell grab is used, the carrying power must be higher than the multi-shell grab by about 30 percent due to the bad volumetric efficiency of the two-shell grab. A table gives technical data for the two types of cranes. As to the problem of using a hoisting unit with planetary gear or with differential limit switch, the planetary gear was found to be better suited for waste. Here the grab is never completely closed because the waste is often bulky and mats easily, which would strain the closing mechanism of the differential limit switch too much. In many smaller waste incinerator plants, electrohydraulically driven grabs are used because they do not require special hoisting units. However, they are more sensitive to impacts, and they are more frequently plagued by troubles. (Text-German)

67-0610

Power from refuse. AEI Engineering, 7(2):59, 1967.

Data are given on the largest refuse disposal plant in Great Britain (Deepham Works, Enfield, North London), which is being planned by the Greater London Council. The normal continuous load will be 1,333 tons of rubbish with a peak capacity of 1,667 tons a day which will be delivered to the installation at the rate of 700 vehicle-loads a day. The electrical output from the incineration of this refuse is expected to be between 27 and 40 mw depending on the heat value of the refuse. The recent placement of orders for the mechanical and electrical equipment included a £2.5 million generating plant contract with AEI for four 12.5 MW and two 2.5 MW turbine generators along with heat exchangers, switchgear, and transformers. The four operating (and one standby) boilers will be fed by grab crane from storage bunkers with the refuse being burned on rolling grate incinerators. The prevention of dust and odor emission has received special attention. After all the combustibles have been burned the residue of clinkered ash and metals are separated in the residuals handling plant for subsequent distribution. The AEI turbines will be designed for inlet steam conditions of 600 lb per sq in. and 840 F and will pass steam to the condensers at 1.75 in. of mercury. Because of the range of possible steam output, extensive control equipment will be provided. This will be the first incineration plant in Britain to supply power to the grid.

67-0611

Refuse incineration and clinker sintering plant at Berlin-Ruhleben. Berlin, Ger., Berlin Municipal Cleansing Service, Feb. 1967.

The three processing schemes in operation at the Berlin-Ruhleben refuse incineration and clinker sintering plant are described. Using these processes, it is possible to turn waste into valuable and marketable aggregate for concrete and asphalt without leaving any residue. The installation consists basically of the refuse incineration plant, the clinker processing plant, and the sintering plant. Bulky waste is first passed through shears to reduce it to size and then incinerated. Should the furnace temperature fall below 1,000 C auxiliary burners are activated. The flue gases which leave the furnace with a temperature of up to 1,000 C, are cooled to 200 C and are partly purified of dust in a steam generator. The volume of heat liberated during incineration is supplied to the neighboring power station in the form of steam. The incineration residue represents 15 to 20 percent of the original refuse and is transfered to a clinker bunker. The coarse waste clinker is followed by scrap metal removal and controlled sifting. Non-ferrous metal and ceramics are dumped. The prepared clinker is then mixed with a fine, already sintered material, and if necessary, with coke, moistened and then sintered in a high, near melting temperature. Dust extraction is through an electro-flue gas filter. The sintered material is ground, cooled and sifted. The 0 to 3 mm fraction is fed back to the sintering process. Finished sinter of 3 to 7 mm, 7 to 15 mm and 15 to 25 mm grain is then stored in silos. Good to excellent reports have been received in regards to workability, solidarity, and durability of the sintered product. Data and illustrations are included.

67-0612

Refuse incineration plant at Deephams Works. Engineer, 223(5805):641-642, 1967.

An incineration plant, which will be one of the largest in the world and the first in Great Britain to use continuous total incineration for generating electric current for sale, is described. The plant, designed to handle up to 700 vehicle loads a day, will have a normal continuous throughput of 1,000 tons of crude refuse every 24 hr and a peak of 1,667 tons. The electrical output is expected to be between 27 and 40 MW, depending on the heat value of the refuse. The general layout of the plant is shown in a detailed diagram. The specification calls for five boilers, each capable of burning 14 tons of refuse an hour and producing steam at 625 lb per sq in. gauge and 850 F. The evaporation capacity of each boiler will be a maximum of 86,000 lb steam per hr. Other equipment includes two computerized weighbridges, 23 unloading bays serving five refuse storage bunkers, three overhead cranes, and stepped roller type grates in the incinerator. The steam raising unit will be of the Yarrow single-drum, water-tube type with a partially water-cooled combustion chamber and superheaters arranged in two stages giving steam temperature control down to 70 percent MCR. From the superheaters the gas will pass to an economizer and then to an electrostatic precipitator. The cleaned flue gases will contain not more than 0.05 grains of dust particles per cubic foot of dry gas at STP. Disposal of fly ash and boiler residuals is described. The power generating plant, which will be contracted out and which will supply the electrical requirements of the refuse plant, is also described. The cost of the plant is estimated at £9,000,000 and is programmed for completion in 1970.

67-0613

Restriction of emission waste incineration in plants with throughput up to 1,500 kg hr. VDI-Richtlinien 2301. Duesseldorf, Ger., Verein Deutscher Ingenieure, Feb. 1967. 9 p.

Incinerators designed for local and decentralized use are rated by throughput capacity. The throughput capacity is limited in this report to a maximum of 1,500 kg per hour. Waste incinerators must be designed to meet fairly rough operation, varying properties of waste, and fluctuating thermal loads. Charging and ash-removal fittings must be so designed that nuisance by dust and odors will not occur. The flue gases of every waste incinerator should be released through a separate stack that is constructed in accordance with valid standards and building regulations. Waste incinerators should be provided with an auxiliary burner to preheat the incinerator chamber and maintain uniform combustion. If complete combustion is not insured by the design of the incinerator chamber, a secondary-combustion process must be applied. Smaller incineration units are mainly suitable for doctors' offices, smaller residential buildings, and workshops. Larger units are installed in hospitals, institutions, office buildings, etc. Continuous expert servicing is required for the proper operation of waste-incinerating plants, particularly of larger units. Proper operation requires preheating of the incineration chamber, and the auxiliary burners must be switched on in good time. When planning a waste incinerator the basic load and permissible total load caused by dust and gas in the vicinity of the site must be taken into account. The smoke-plume color in accordance with the Ringlemann scale must be less than No. 2 in running operation with any type of waste. The particulate emission must not exceed 200 mg per cu m STP for moist flue gas at the stack outlet. (Text-German)

67-0614

Rogus, C. A. Incineration can be clean and efficient. Power, 111(12):81-85, 1967.

The incineration systems of the United States and Western Europe are compared. The European plants already incorporate features which the United States is only now considering and their designs are superior to American ones in both efficiency and cleanliness. A refuse comparison showed differences in several significant aspects: European refuse output per capita is smaller; its moisture content is higher and its calorific value is lower making burning more difficult; and its greater content of fines tends to increase the amount of particulates emitted in the exhaust. These factors place added demands on air pollution control equipment. Laws and labor are also compared, with more manpower available, lower pay scales, and excellent worker skill and productivity in Western Europe, as well as stricter government regulations on collection, handling, and disposal. Performance of incinerators, based on thoroughness with which refuse is burned, is superior in Western Europe. Other comparisons involve refuse delivery, handling and burning, residue handling, and air pollution controls. Weighing systems, tipping and dust control, hoppers and chutes, furnaces, grates, the Von Roll, the Drum grate, and the Martin are also considered.

67-0615

Schiemann, G. Results of emission measurements in incinerators for household refuse. Brennstoff-Waerme-Kraft, 19(9):440-443, 1967.

Measurements of dust emission were made in 23 small refuse incinerators in the vicinity of Duesseldorf and Koeln (Germany) and in one large unit with a capacity of 20 tons refuse per hr. The results showed that the small units with an average capacity of 2.5 tons per hr have an emission of 4 kg per hr of dust. The large unit, however, had an emission of only 3.2 kg per hr. The small units therefore emit 1.6 kg dust per ton refuse while the large unit emits only 0.16 kg dust per ton refuse. Combustion in large centralized units is therefore more advantageous from the viewpoint of air pollution. (Text-German)

67-0616

Schneider, W. Elimination of domestic waste and refinery wastes. Brennstoff-Waerme-Kraft, 19(10):502-503, 1967.

The East German Association for Fuel Engineering held a meeting in Leipzig on June 1-2, 1967, and discussed questions of domestic and refinery waste disposal. It was indicated that by 1980, forty composting plants will be built in East Germany. Large waste incinerator plants are planned for the wastes accumulating in metropolitan areas. To gather experience in this field, a large waste incinerator plant with a capacity of 180,000 tons per year will be erected in Berlin in 1968. Alkali and sulphur-containing products are burned at low temperatures to prevent the escape of alkaline substances. Sulphuric acid and bleaching earth are mixed with soft coal dust and converted into a non-corrosive, powdery product which can be either burned in soft coal power plants or in a rotating tube furnace of a gypsum-sulphuric acid plant. The sludges obtained in the purification of refinery waste water contain only about 1 percent of solids and must be dehydrated prior to incineration. At a solids content of 18 percent and a heating value of 800 kcal per kg, the sludge can be burned in a turbulent layer furnace without an auxiliary burner. Story furnaces are used for the incineration of sludges whose solids content has been increased to 30 percent. A comparison of the rotating tube furnace, the story furnace, and the turbulent layer furnace, shows the latter to be most economical. The technical requirement is low, and the heat utilization is high. (Text-German)

67-0617

Schoppe, F. The development of a flame cone for waste incineration. Brennstoff-Waerme-Kraft, 19(10):469-476, 1967.

The flame cone is described and illustrated. Through its rotating motion, the fine parts are separated from the coarse parts, i.e. through the larger angle of the slope the fine material is transported closer to the apex of the cone. The flame cone is thus also used for separating material which is too moist to be separated in a sieve. For incineration the cone surfaces are made of cast bars. The ash falls at intervals between the bars into a container underneath. The burning waste is carried along the cone wall to the cylindrical end, constantly gaining in temperature through the continuing incineration process. From the cylindrical end of the cone the burning waste rolls back into the cone where it ignites and heats up unburned waste. In this way ordinary waste reaches a temperature between 1,100 to 1,300 C within 15 to 20 minutes. The ash is discharged from the flame cone into the ash container and remains there for about 20 to 30 minutes. The ash surface is well ventilated so that the incineration of still burning parts is completed. Air with a velocity of 50 to 70 m per second is blown into the flame cone and a cylindrical afterburner is connected with the flame cone. Illustrations and a detailed description of the afterburner are given. The waste gases are cooled down to 250 C either by water injection or in a heat exchanger or a waste heat boiler. The smallest flame cone has a diameter of 1,100 mm at the base which corresponds to a capacity of 200 to 400 kg per hr. The most frequently used flame cones have a diameter of 1,800 mm and can burn 1,200 to 1,400 kg per hr of waste. The performance of the flame cone incinerator was tested with various kinds of waste such as ordinary waste, bulky waste, plastic waste, and material retained on a trash rack. Detailed results of these tests are given. (Text-German)

67-0618

Sebastian, F. The worldwide rush to incineration. American City, 82(12):40, 1967.

Efficient, clean incinerators in Paris, Duesseldorf, Leverkusen, London, and Japan, which will dispose of refuse and sewage sludge, are described. Paris' new refuse plant is perhaps the world's most sophisticated. It converts 1,400 tons of refuse to steam daily. Television cameras monitor all important plant operations, and electrostatic precipitators clean the gases well enough to pass any U.S. air-pollution codes. In Duesseldorf, an equally attractive, efficient plant, but with less sophisticated cotrols, disposes of 960 tons of municipal and industrial refuse daily. The excess heat also generates steam, and cleansing is so thorough that stack gases read less than Ringlemann No. 1 most of the time, and never more than No. 2. Metallic scrap is magnetically separated from the burned residues and baled for sale at $12.50 to $25 per ton. The balance of the residue is sold for fill at 10 to 20 cents per ton. Duesseldorf receives about $700,000 per year in income from these operations, enough to cover all operating costs. London's new 1,600 ton per day incinerator will generate $1.4 million of steam per year and reclaim $280,000 of residue. It will discharge less than 0.05 grains per standard cu ft of dust in the exhaust. Japan has several multiple-hearth incinerators to dispose of sewage sludge. The largest, at Tokyo, has a capacity of 100 tons per day. In Osaka, the sewage ash helps make bricks and fills roadbeds.

67-0619

Setti, B. and G. Andreoni. Refuse incineration plant in Milan and heat availability for urban areas. Fumi Polveri, 7(6-7):135-147, 1967.

Considerable graphic material and statistical data are presented on the general operation of the refuse incineration plant in Milan. Together with four other projected plants, it would account for a refuse burning capacity of 2,000,000 kg per day, and a heat combustion of 2,000 megakcal. This heat could be converted into 280 million kw hr, or enough energy for municipal power requirements of the water, light, and transportation facilities. Future increases in air pollution will require administrative measures in order to combat it. (Text-Italian)

67-0620

Sibiga, J. The development of the technology of urban trash combustion. Gaz, Woda I Technike Sanitarna, 40(9):312-315, 1967.

For trash combustion (in which all the carbon is burned to carbon dioxide), any kind of furnace will suffice if it can handle material which develops no more than 2,000 to 3,000 kcal per kg during combustion. The various furnaces employed are illustrated. The oldest was the Boussange furnace. The Horsfall furnace, developed next, differed only in minor details. The next was the Woodall-Duckham furnace, which had a chimney damper. In the Monohearth furnace the improvement consisted of a more efficient addition of water to the ash. The Heenan & Froude furnace had staggered compartments. The Voelund-Wistra furnace introduced a fairly complicated system of airflow, whereas the furnaces of the Pyro-Incinerator and Supply Corporation brought about improved combustion by the introduction of special grate systems. The Roll furnace was the first in which steam was economically generated in a bundle of tubes. All the features mentioned are incorporated in the furnaces of the Dusseldorf system, the Flynn & Emrich system, and the New York City system (Text-Polish)

67-0621

Sibiga, J. The incineration of trash or garbage—an economical problem. Gaz, Woda I Technike Sanitarna, 39(1):23-26, 1967.

Although the problem of trash and garbage disposal through burning is not new, older installations of this type (Voelund furnace, in Denmark; von Roll, in Switzerland; Martin, in Duesseldorf and Essen; and Semmler, in Esslingen) are outmoded. In many cities of Europe, America, and Asia, trash is burned in installations of the Dorr-Oliver type, as well as those of the Dano, Baden-Baden, von Meanen, and Buhler types. Cost is not the major factor to be considered, since combustion prevents air pollution, river pollution, and spread of disease. Nevertheless, sufficient funds must be available. The cheapest unit today is located in Ruschlikon (Switzerland) and cost $84,000. The plant at Tjenbeke cost $2,130,000. The combustion of one long ton of trash costs $2.50 to 5.50; if amortization costs are considered, this cost rises to $2.75 or even $6.50. (Text-Polish)

67-0622

Sibiga, J. Technical possibilities of combustion of municipal refuse. Gaz, Woda I Technike Sanitarna, 40(8):270-271, 1967.

The technical possibilities for the combustion of municipal refuse are outlined in a study of the increasingly urgent problem of trash and garbage disposal. Combustion is considered by many to be a panacea, although others consider this method a luxury. The amount of kcal produced per unit of garbage is a meaningless figure without considering the bulk weight of garbage received, which may vary from 195 to 450 kg per cu m. Thus, the heat developed per unit of weight must be considered, as well as per unit of volume. If trash is burnt just for the sake of combustion, installations are simple but produce nothing of commercial value. Installations generating steam by combustion of municipal refuse, or electricity, or a combination of both, cost more at installation but produce a marketable product. A survey of European and American plants shows that between 800 and 1,750 kcal per kg is recovered from trash combustion, while plants with lower yields are not necessarily less economical, since they operate without any additional fuel. (Text-Polish)

67-0623

Small waste incinerator for hospitals, schools, and factories. Sanitaer und Heizungstechnik, 32(11):847, 1967.

An electrically operated incinerator had been developed by Saniguard Appliances Ltd. The unit can burn 45 liters of waste (e.g. paper, bandages, boxes, etc.) at a time. The operation is initiated by stepping on a pedal. The incineration cycle lasts at the most 2 hr. An adjustment to shorten the incineration period is possible. The unit is 102 cm high, 55 cm deep and 50 cm broad. The waste is completely burned to sterile ash. (Text-German)

67-0624

Stabenow, G. New incinerator at Munich, West Germany, In Proceedings; MECAR Symposium, Incineration of Solid Wastes, New York, Mar. 21, 1967. Metropolitan Engineers Council on Air Resources. p.22-23.

A feasibility study for a satisfactory method of refuse disposal for the city of Munich (population 1,200,000) concluded that a 60-megawatt power plant could burn the refuse economically if the ratio of refuse to pulverized coal firing would not exceed 40:60. This arrangement permits continuous power generation even during periods when refuse is not available for burning. In Phase I of the installation, two Benson-type boilers were installed, each to generate 220,000 lb of steam per hr at 2,600 psig. The refuse firing rate was 27.5 ton per hr at an average net heating value of 2,500 Btu per lb. The combined firing of the refuse on the Martin reverse acting grate and the pulverized coal firing in a separate furnace generates a total quantity of 440,000 lb of steam per hr at 2,600 psig and 100 F. Forty percent of 176,000 lb of steam per hr is generated by 50 tons per hr refuse burning, and the balance of 264,000 lb per hr results from pulverized coal firing. In the Phase II installation, the steam output was raised to 800,000 lb per hr. The resulting refuse to coal ratio was changed to 20:80 percent. The incinerator power plants are illustrated. Electrostatic precipitators, which have an efficiency of 99.75 percent are installed on the roof of the building to limit the particulate emission with the stack gases to less than 0.2 lb per 1,000 lb of products of combustion corrected to 50 percent excess air. A breakdown of operating costs is appended.

67-0625

$25-million incinerator will be Britain's largest. Refuse Removal Journal, 10(7):16, 1967.

A new incinerator will be built to handle about one-fifth of all of London's solid waste. The plant, to process 1,333 tons of crude waste daily, is scheduled for completion in 1970. Trucks will be able to unload in 23 unloading bays. The incinerator consists of five parallel systems, of which four are to operate continuously. Each system consists of a storage bunker, charging hopper, and steam boiler. A large sewage works will provide a ready supply of cooling water. A large fan in the upper part of the building will prevent dust from escaping into the atmosphere. Grab cranes will be used to pick up the stored refuse and transfer it into the charging hopper and a hydraulic ram will push the refuse from the hopper onto the boiler grate. Hot flue gases will be directed over the incoming material to ensure rapid ignition and the burning refuse will turn and fragment as it spills from one roller of the grate to another. Thus, up to 14 tons of refuse will be burned per hour in a chamber. Metals and ashes, after quenching, will be conveyed to a series of screens and a magnet so that the scrap metals can be recovered. The hot gases will pass through the boiler, as well as an electrostatic precipitator, before exiting. The plant will be built on the recommendation of a special commission of the Greater London Council, which has been studying the problems of refuse disposal in the London area.

67-0626

Walter, L. Progress in incineration of town refuse in Europe supplying power and heat. Public Cleansing, 57(3):135-141, 1967.

Among the German cities utilizing combustion of refuse for generation of power and heat, Munich is one of the most progressive. The first phase of plant construction produced steam of 180 atmospheres and 540 to 550 C superheat, generated in two Benson steam generators of 100-ton-per-hr capacity of each. The second phase has a capacity of 100 MW. There are different design features between the two stages. The new steam-turbine unit of 110 MW capacity will be supplied from a single steam generator. Capacity will be 365 ton per hr at 180 atmospheres and 540 to 550 degrees C superheat. The stoker area of 96 sq m is divided into 5 parallel firing zones. The percentage of refuse is only 20 percent of the total combustion capacity. At the plant at Stuttgart 1000 ton per day refuse produce 400 ton clinker and fly-ash; and each stoker is designed for firing of 20 ton per hr of refuse at 800 to 2,200 kg cal per hr. Three furnaces of 8.33-tons-refuse-per-hr. capacity operate in the Vienna plant. Exhaust gases are cleaner and the volume of residue from combustion is 10 percent in volume and 40 percent in weight of the refuse as supplied. The best incinerator was a von Roll incineration system which was operated 24 hours a day and was designed to use waste heat for space heating and hot water supply in two hospitals. The sequence of operation is described.

67-0627

Walter, L. Progress in refuse incinerators supplying light and heat. Public Cleansing, 57(2):60-64, 1967.

American cities have similar problems to cities in Germany though the methods vary. In Western German incinerators, for towns of over 1 million inhabitants there are 230 kg domestic and 56 kg road refuse; and for towns of 10 to 20 thousand, 260 and 30 kg. Though the utilization of waste heat in the United States is practically nill, there are municipal plants in Europe that have it. Volund, the largest and oldest plant, burnt 323,000 tons of refuse in 1961. Refuse is pre-dried, ignited and burned. Final combustion occurs in the rotating drum. Waste heat boilers produce steam for the district system of Paris. The firing system of the Martin Stoker has achieved up to 1,200 tons per 24 hr. It is claimed that low-grade refuse (850 kg calories per kg) can be burnt as well as high-grade (2,500 kg cal per kg). The refuse incineration system developed by the Swiss firm von Roll'sche Eisenwerke was used at Borsigstrasse. With two furnaces the plant's capacity was 200 tons per 24 hr; with the three additional furnaces the increase was 10 million cu cm per annum. Larger von Roll furnaces have a capacity of 300 tons per 24 hr. The first application is for the City of Frankfurt-am-Main where the capacity is 2 times 300 tons per 24 hr, and with two additional units, the output is 1,200 tons of refuse per day. Plant layouts are included.

67-0628

Waste incineration in a textile plant. Brennstoff-Waerme-Kraft, 19(10):493, 1967.

To eliminate its waste, a German textile plant set up an incinerator plant with a capacity of 500 kg per hr. The waste is composed of cardboard boxes with a maximum size of 1,100 per 900 per 600 mm (20%), rubbish and cotton dust containing PVC material (20%), and bobbin sleeves from the weaving department (60%). The waste has an average heating value of 3,500 kcal per kg. The heat obtained from the incineration is used to produce steam which is used for heating purposes. The waste is collected in containers and driven to the furnace building where it is dumped into a storage room. A conveyor belt brings the waste to the combustion chamber of the furnace. The flue gases are cooled down to a temperature of 300 C. A photograph of the incinerator and an illustration of the grate are given. (Text-German)

67-0629

Waste incineration in furnaces with a capacity up to 1,500 kg./hr. (VDI standard 2301). Brennstoff-Waerme-Kraft, 19(10):512, 1967.

The German VDI (association of German engineers) standard 2301 applies to all incinerators with a capacity not exceeding 1,500 kg per hr. The standard cites all causes leading to air polluting emissions and suggests preventive measures. For satisfactory operation of the incinerator, the height of the chimney, the flue gas cleaning equipment, and the design of the furnace must be carefully planned in accordance with the VDI standard. The recommendation VDI 2301 can be obtained at Beuth-Vertrieb GmbH, Berlin and Cologne, Germany. (Text-German)

67-0630

The waste incinerator in Berlin-Ruhleben is in operation. Brennstoff-Waerme-Kraft, 19(7):379, 1967.

A short time ago a waste incinerator in West Berlin was put into operation. It is composed of seven furnaces and equipped with roller grates. Each furnace has a capacity of 16 tons per hr. The connected boilers are designed for 87 atm at 470 C. The incinerator plant is the world's largest, with a maximum daily capacity of more than 3,000 tons. The heat is utilized for the production of electric energy and for remote heating of apartments. The slag is sintered and used in road construction. (Text-German)

67-0631

The waste incinerator of Farbenfabriken Bayer. Brennstoff-Chemie, 48(1):W3-W4, 1967.

The construction of the waste incinerator of Farbenfabriken Bayer AG, Leverkusen, which was started in Oct. 1965, is almost completed. Operation is scheduled for the Spring of 1967. The incinerator will handle 100 tons per day and will cost about 15 million DM. Solid waste is incinerated in rotating furnaces; liquid waste is sprayed into special flame chambers by nozzles. At the furnace temperature of 1,200 C all organic compounds are completely destroyed. The stack gas passes a waste-heat boiler, and, after filtering by electrostatic precipitators, leaves through a 100 m high steel chimney. Organic waste containing chlorine is burned in special chambers. This stack gas passes a scrubber and an electrostatic wet cleaning stage before it reaches the chimney. (Text-German)

67-0632

Waste paper incinerators 'Silo-Papyrex' Rohr-Armatur-Sanitaer-Heizung, 22(4):338, 1967.

The metal company Siegas, Cologne, West Germany, introduced two new waste paper incinerators. The type Papyrex 75 (volume 75 liters) is suited for outdoor operation. It consists of a combustion chamber, a grid with air pipe, a conical flue gas collector, and an exhaust pipe. The waste paper is stuffed into the combustion chamber and lighted at several points. Then the conical flue gas collector is attached. After about 20 to 30 minutes the paper is burned. The type Papyrex 100 (volume 100 liters) is intended for connection to a chimney. Its operation is very simple. (Text-German)

67-0633

Weiand, H. Waste incinerator plant in Oslo. Brennstoff-Waerme-Kraft, 19(10):496-497, 1967.

After intensive investigations and preparations, the city administration of Oslo, Norway, decided to build a large incinerator to burn most of the accumulating waste (145,000 tons per year at a population of 500,000). For the rest of the waste, small composting plants will be set up. The incinerator, being built by a German company, will consist of four furnaces and will have a capacity of 180,000 tons per year. Two of these furnaces with a capacity of 6.5 tons per hr each have been delivered, and the test operation was started in February 1967 and successfully completed in August of the same year. The new incinerator has been designed to burn the waste to sterile slag and fly ash which can be deposited safely. Protective devices against odors, noise, and dust emissions have been installed. The heat obtained through incineration is used for production of energy. The plant is composed of a large storage building, a furnace and filter building, a slag storage, and an office building. The storage building has a capacity of 8,000 cu m. Steam heaters keep the temperatures in the waste and slag storage buildings at 5 C even when the outside temperatures drop to -20 C. The slag discharged from the incinerator contains only 2 to 3 percent of combustible material. All essential data are listed in a table. Illustrations of the furnace, the boiler, the grate, and the layout of the incinerator plant, are given. (Text-German)

67-0634

Wolf, M., and J. W. Jacobi. Waste incineration. Brennstoff-Waerme-Kraft, 19(4):191-193, 1967.

A literature report in the area of waste incineration is presented.

Incineration–Europe

Seventy-eight papers published in 1966 are listed and characterized as belonging to one of the following classes: technical problems; processes; descriptions of facilities in operation; new facilities; treatment of sewage sludge; and foreign countries. (Text-German)

67-0635

Wotschke, J. On the path to universal waste removal. Brennstoff-Waerme-Kraft, 19(10):476-481, 1967.

A pilot plant, operating according to the flame chamber melting method, had been set up by the Volkswagen plant to incinerate its waste. The first experiences showed that the method is very well suited for universal waste incineration although some modifications of various component parts are necessary. The basic principle of the flame chamber melting method is discussed, namely the complete consumption of the gaseous parts in the waste by flames and the complete liquefaction of the incombustible parts among the waste. This state is automatically achieved in the flame chamber as soon as the required operating temperature is reached. The velocity of the reaction is determined by the difference in temperature between the flame and the decomposing waste surface. The decomposing layers of small grained waste and of heterogeneous household waste are shown in photographs. Experiences showed that more effective cooling and protection of the flame chamber are obtained with a higher operating temperature. A characteristic of this method is that every component must wait until it reaches its melting point to be able to run off. All components however, combine eventually into one uniform melted layer which acts like a filter retaining all solids from the gases formed in the process and penetrating this layer. Since air is blown in from the top, the gases are forced to leave the flame chamber at the bottom. The gas is to a large extent burned in the flame chamber so that corrosion at the flue gas ducts is avoided. The design of a small incinerator with a capacity of about 1,000 kg per hr employing the flame chamber melting method is illustrated and explained. For demonstrating purposes and for investigating the suitability of this type of incineration in particular cases, a small testing facility was developed. (Text-German)

INDUSTRIAL WASTES

67-0636

Aarons, R., and R. A. Taylor. The DuPont waste pickle liquor process. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.120-125.

The DuPont process involves continuous neutralization with lime and simultaneous oxidation of soluble iron to insoluble magnetic iron oxide to produce high-density, low-volume granular solids which are easily separated and disposed of. The advantages and disadvantages of alternate disposal methods are reviewed. The overall chemical reactions in the DuPont process are diagrammed. Waste pickle liquor and a chemically equivalent amount of hydrated calcium oxide are continuously withdrawn. Air is sparged into the mixture to oxidize the iron. Live steam is fed into the reactor to maintain a temperature of 190 F. By keeping the reaction mass at pH of 7, ferrosoferric oxide, or magnetic iron oxide, is formed. The controlled neutralization produces a clear effluent. The neutral solids, weighing about one-sixth as much as the sludge derived from simple lime neutralization, are easily dewatered and are suitable for landfill. The iron oxide can be separated magnetically. The gypsum content has been evaluated by a manufacturer of wallboard and found to be useable.

67-0637

Adema, D. The largest oxidation ditch in the world for the treatment of industrial wastes. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.717-730.

The waste water treatment system of a coking plant in the Netherlands consists of a large Pasveer ditch with a capacity of 30,000 cu m. Biological purification under denitrification conditions is described. In the beginning of 1966 a shortage of phosphorus caused the efficiency of the biological purification to fall off and little or no denitrification to take place. Laboratory experiments were carried out to examine the effect of the phosphorus shortage. The maximum capacity of the ditch is put at 1350 kg of COD per hr (excluding 385 kg of COD per hr per 100 kg of nitrate-nitrogen). Data included for the Pasveer ditch include: dimensions of the ditch; make, speed, and power of the brushes; dimensions and capacity of the settling tanks; and investment and operating costs.

67-0638

Aerators solve waste treatment problem. American Dairy Review, 29(4):40, Apr. 1967.

In processing 600,000 to 800,000 lb of whole milk daily, the Arkport, New York, plant of Grandview Dairy discharges 250 gal per minute of effluent into its milk waste disposal facility through lagoons, which were previously sprayed upward for aeration. Added chemical nutrients cost over $2,000 per year. In 1964, two Lightnin aerators, utilizing five pumps and powered by two five-hp motors, were installed to provide additional aeration. Problems of odor and lack of dissolved oxygen in discharged water were eliminated. Previous strength of discharged wastes were 235 ppm of BOD. After installation of the aerators, BOD dropped to 25 ppm--an 89.5 percent reduction. The aerators provide considerable savings in operating and maintenance cost. The need for chemical nutrients was eliminated.

67-0639

Agardy, F. J., R. G. Spicher, and G. T. Orlob. Cannery waste treatment part II. Treatability. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.699-705.

Characterization of organic material in cannery wastes included: dissolved versus suspended solids, volatile and inert matter, disposition of BOD and COD. The rate of aerobic biodegradability was evaluated by determining the BOD reaction velocity or 'rate' constant for the waste under study. The cannery wastes studied were found to have a high percentage (in excess of 80 percent) organic matter in solution. This distribution of organic matter favors the employment of biochemical treatment methods suitable for stabilization of dissolved organics as opposed to physical processes. The effluent waste streams, regardless of specific character, responded to biological action at a rate considerably higher than is normally found with domestic sewage. Average values for peach and tomato wastes are given. The peach waste stream is the strongest plant effluent in terms of first stage BOD. When peaches only are processed the BOD of the effluent may be expected to be about 3 times that of normal domestic sewage and about 4 to 5 times that of the effluent from tomato processing. While the principal effluent streams were apparently free of inhibitory agents and possessed no characteristics which would preclude their stabilization in the presence of 'seed' of domestic sewage origin, there is a possibility that high concentrations of cannery waste might result in a reduction of biodegradation rate due to lack of required nutrients or presence of trace inhibitory agents.

67-0640

Akerman, K., and L. Reysner. The utilization of industrial waste obtained during the course of the production of phosphoric acid. L'Industrie Chimique, 54(599):179-185, June 1967.

The disposal of waste arising from the production of phosphoric acid by a wet process has become a problem because the costs of dumping the waste in landfills or into the sea have become prohibitively high. It is therefore indicated to investigate the possibilities for utilizing this waste, which is phosphoanhydrite (also called phosphogypsum). Following previous work performed in the USSR, the authors made detailed studies and model experiments in order to gain exhaustive information on the most economical way of producing sulfur dioxide and lime, or Portland cement from phosphoanhydrite. The process was performed in a rotary cement kiln in five steps: calcination of the phosphoanhydrite, first grinding, second grinding and mixing with coke, hydration of the charge, and baking of the charge to develop sulfur anhydride and cement. Some of the optimum parameters determined are the following: temperature of the charge, 1,300 to 1,350 C; content of coke, 6.2 percent; oxygen concentration in the gas, 0.2-0.4 percent. Under these optimum conditions the decomposition of the phosphoanhydrite is 97 to 99 percent. In a second part of this article the properties of cement derived from phosphoanhydrite are reviewed and summarized. Seven tables give numerical data on composition and crushing strength of various types of concrete obtained by varying phosphoric anhydride content. A phase diagram of calcium oxide, phosphorus pentoxide, and silicon dioxide and a graph of the crushing strength of cement as a function of phosphoric anahydride content are given. The crushing strength decreases linearly with increasing concentration of phosphoric anhydride, becoming zero at about 3 percent. The necessity of a thorough study of optimum processes and of pilot plant experimentation is stressed in the summary. (Text-French)

67-0641

Akyel, H., and M. Neven. High molecular organic, synthetic flocculant for sludge treatment. Chemie-Ingenieur-Technik, 39(4):172-178, Feb. 1967.

Purely synthetic, organic flocculants which are more effective than the metal salts, have been increasingly used to improve the filtering of sludges. The three groups of flocculants, non-ionogenic polymers, ionogenic polymers, and non-ionogenic/ionogenic polymers, are described. Flocculants increase the sedimentation speed. Two methods to test the speed (shaking and stirring) are described. With the aid of laboratory test set-ups, the effectiveness of flocculants in the vacuum and pressure filtering process can be tested. To test the qualification of flocculants for dehydrating the sludges in centrifuges, very expensive laboratory models have to be used. With the addition of flocculants, sludge particles of all sizes settle at about the same speed and a clear separation between solids and water becomes visible. A diagram shows the settling speeds of sludges with and without flocculants. To achieve an optimum clearing of the water, the stage at which the flocculant is added, and the amount, are of extreme importance. (Text-German)

67-0642

Albertson, O. E., and J. Guidi. Advances in the centrifugal dewatering of sludges. Water and Sewage Works, 114:R133-R142, Nov. 30, 1967.

The solid-bowl centrifuge, as a method for dewatering of all types of waste sludge, is described. Centrifuge tests were conducted at over 70 locations with 40 to 50 runs made on the sludge at each location to determine the optimum machine performance and effective variables such as pool depth, feed rate, and centrifugal force. Cationic polymers were used, although in a few instances they were combined with anionic polymers. Tables show the summary results of centrifuging various types of sanitary sludges and pulp and paper waste in terms of cake moisture, recovery, and chemical cost. It was concluded that improvements in conditioning agents suitable for centrifuges has eliminated the problem of solids recycling via the liquid discharge. The centrifuge will have an installed cost of 50 to 70 percent of that for a comparable vacuum filter, with operating costs equal to or less than those required for a filter. Other advantages of the centrifuge in sludge dewatering applications are: low space requirements; no direct supervision required; simple start-up and shutdown procedures; dilute or thick feeds handled equally well; easily automated to fit into process requirements; and operation can proceed with only intermittent dosage of chemicals.

67-0643

Alikonis, J. J., and J. V. Ziemba. Waste treatment. Food Engineering, 39(7):89-97, July 1967.

The waste disposal problems of food plants are reviewed and solutions are given with illustrations of specific installations. Wherever possible foodplant wastes should be combined with municipal sewage for treatment. Sewer charges generally run about 1½ to 4 cents per lb of BOD with a similar charge for each pound of suspended solids. A picture and flow sheet of an activated sludge plant are shown to indicate the secondary treatment of liquid wastes by aerobic decomposition of the solids in a sugar beet plant which uses 14 million gal of water per day. A flow sheet is given of a centrifuge system which when combined with skim and flotation tanks can separate salable fat from plant wastes and discharge clarified effluent to a sewer. A table is given showing the relation between waste and unit processed for a number of industries. For one hog, the meat packing industry has a volume of waste of 360 to 800 Imp. gal and 3 to 4 lb of BOD per hog. For poultry processing of 1,000 broilers, the waste is 2,600 to 12,000 gal and the BOD 50 lb. A flow sheet is given of a triple lagoon system which comprises three linked lagoons (anaerobic, recovery, and aerobic) for the treatment of packinghouse wastes. A more elaborate plant for packinghouse wastes includes an extended aeration and digester unit and a 5-acre aerobic stabilization pond which is shown on a process flow diagram. The estimated volumes of waste water from various operations in canning fruits amount to 2,400 gal per ton. Feasibility studies are advisable in planning waste disposal systems because of the size and complexity of the problem.

67-0644

All-weather technique for applying sludge to farmland. Surveyor and Municipal Engineer, 127(3857):26, May 7, 1967.

The all-weather technique for applying liquid digested sludge directly to farmland from a tanker standing at the roadside developed by the Burgh of East Kilbride is described. Pictures show: a tanker typical of three in service with a 2,000-gal tank on a Comer chassis; a close view of the pump outlet and pump connection on the tanker; the spray-gun irrigation system in operation; and an installation showing the spray-gun 400 ft from the tanker. Farmers who have participated in the project have observed such a visible improvement in grazing pasture that the demand now exceeds the supply. The liquid sludge can be pumped from three 2,000-gal tankers at the rate of 30,000 gal a day when operating within 14 miles of the sewage works. The tank can be filled in 7 minutes and can also discharge 2,000 gal from the tanker at the roadside in 7 minutes over one-third of an acre at distances up to 400 yd from the tanker. The wet sludge has an ammoniacal concentration of nitrogen of 1,100 ppm and the nitrogen is applied to the soil at the rate of 120 lb per acre in the form of ammonia. Although the risk of contamination of the fields by toxic metals is considered negligible, a routine analysis is made of the sludge, including a chromatographic examination for metallic ions. The pumping apparatus has been modified so that the tanker can be used for emptying cesspools, septic tanks, and the removal of various sludges from trade effluents or from farms. Patents have been applied for the pumping equipment. Prototype equipment for a new sludge sterilizing plant is being considered.

67-0645

At sea about chemical wastes. Chemical Week, 101(16):133, 134, 136, Oct. 14, 1967.

The increased number of chemical companies becoming involved in the disposal of waste at sea are facing a number of problems such as the costs of barging, the need for special barges, the care needed to prevent 'fish kills' or other incidents, and the existing and prospective governmental regulations. The barges out at New York are assigned dumping locations by the harbor supervisor which are at least 15 miles out for acids and 125 miles or beyond the continental shelf for toxic materials. The harbor supervisor exercises his control of the dumping areas by his control of passage through the harbor. A picture is shown of the barge, 'Sparkling Waters', heading out to sea with a load of waste. This $850,000 barge with a 5000-ton capacity is not sufficiently in use to satisfy the owners who claim they can dump 5,000 tons of waste beyond the continental shelf at $2 to $4 a ton. Dupont has a million dollar barge ready to haul wastes from a titanium dioxide operation at Edge Moor, Delaware, for disposal 100 miles at sea. The controls exerted on the East Coast do not seem to apply on the Gulf and West Coast. The Halocarbon Products Corp. investigated the disposal of a zinc slurry at sea and found that it was more economical to precipitate out zinc oxide and dispose of it with solid garbage.

67-0646

Attleborough sewerage and sewage disposal scheme. Water and Waste Treatment, 11(10):456, 458, Nov.-Dec. 1967.

A sewage treatment works with provision of main drainage facilities, which is under construction and will serve the Norfolk town of Attleborough, England, is described. Completion is expected early in 1968 at a cost of £408,000. The work includes the construction of about 9,300 yd of G.V.C. and concrete sewers, 5,000 yd of asbestos cement rising main, four pumping stations, and treatment works designed to serve a population of 5,000 with additional capacity for treatment of trade effluent equivalent in pollution load to another 9,350 persons. At the treatment works, sludge is discharged under hydrostatic head to the pumping station, while the flow over the weir is directed through a distribution chamber onto four 78-ft-diameter biological filters. The effluent from the filters is gravity fed through a distribution chamber to three humus tanks and, before final discharge into a stream, is returned to the sedimentation tanks and flows in excess of 3 times DWF are directed to a land irrigation area through a 9-in. gravity main. In addition, facilities are being provided for the reception of trade effluent from a cider manufacturing plant which consist of a pumping station, two balancing tanks, and means for controlling the rate of discharge to the sewer.

67-0647

Automatic sludge lifting machine reduces labor force. Consulting Engineer, 31(1):72, Jan. 1967.

An automatic sludge lifting machine designed for operating on existing sludge drying beds arranged with cross walls is discussed. In addition to sludge lifting, the machine levels the top surface of the under media to the correct depth, and the aggregate can then be transported via the detachable hoppers, distributed on the under media and screening level. The machine is described as a main beam spanning the sludge beds, mounted on two end carriages running on wheels along rails on the longitudinal bed walls. The sludge lifting digger which is combined with an elevator, is supported by this structure. Materials used for construction and preservation of the apparatus are mentioned. All operations may be switched to manual control or automatic.

67-0648

Azeemoddin, G., et al. Recovery and characterization of phosphatides from solvent extracted groundnut oil sludges. Indian Journal of Technology, 4(1):28-29, Jan. 1967.

A study on the recovery of phosphatides from groundnut oil sludges is reported. Four samples of the sludges were obtained from solvent extraction plants and analyzed for their constituents. The four different extraction procedures used on the sludge were; soxhlet extraction with light petroleum; slurrying with light petroleum and centrifuging; upward percolation of N-hexane in a batch extractor. In each case, total lipids were extracted and after removal of the solvent, phosphatides of 85 to 88 percent purity were precipitated by the addition of cold acetone. The phosphatides were generally yellow to light brown in color and free-flowing powders, though liable to cake when exposed to the atmosphere for longer periods. Analysis of the recovered phosphatide samples indicated that they are phosphoamino lipids with 28 to 36 percent lecithin and 60 to 65 percent cephalin content.

67-0649

Bacon, V. W. Sludge disposal. Industrial Water Engineering, 4(4):27-29, Apr. 1967.

Four methods are used by the Chicago Sanitary District for sludge disposal: fertilizer production, air drying beds, a Zimmermann Plant, and heated digestors. The four methods, are costly and not trouble-free. Previously, ultimate disposal was by dumping. Pumping sludge through high pressure pumps from treatment plants to sandy agricultural lands for reclamation was proposed. Digested sludge is 2.89 percent solids and 97.11 percent water. It is very rich in nitrogen, phosphorous, and potassium. Applying the solids via the water vehicle will not only yield water for irrigation but also prevent loss of some fertilizer content. Dry solids have nitrogen (4 percent), phosphorous (3 percent), and potassium (1/25 percent). Using digested sludge (solids and water) yields 5, 3, and ½ percent, respectively. Since digested sludge is natural organic material, it provides increased humus content, soil fertility, soil structure, and water holding capacity. The Sanitary District has entered into a contract with the University of Illinois' Department of Agronomy to investigate surface and ground water contamination, soil pollution with heavy metals and salt, and facts relating to method, frequency, and time for safely applying digested sludge on land.

67-0650

Baelz, W. Extent and progress of alkaline sludge decomposition of organic substances of various composition. VDI (Verein Deutscher Ingenieure) Zeitschrift, 109(26):1229, Sept. 1967.

The composition of the organic substances to be putrefied was determined, and the decaying process was observed. The decaying processes of sewer sludge and of synthetic fresh sludge were observed in 56 experiments with a single addition of the organic substance and in 26 experiments with continuous addition of the organic substance to be putrefied at constant temperatures in the rotting tanks. The extent of anaerobic decomposition, the time necessary for the decomposition, and the decomposition process are primarily determined by the composition of the organic substances. The state of the decomposition is more accurately indicated by the carbon content than through measuring and analyzing the arising sewer gases. All experiments showed that the carbon content at the end of the process amounted always to about 53 percent, regardless of the initial carbon content of about 44 to 76 percent, and of the decaying time, which varied from 10 to 300 days. (Text-German)

67-0651

Bailey, T. E. Measurement and detection of eutrophication. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, 93(SA6):121-132, Dec. 1967.

A relatively new technique of measuring chlorophyll concentrations by fluorometry is described and the preliminary results are outlined. The fluorometric technique can be used practically without limitations, after the primary environmental chlorophyll relationships have been defined. These relationships, which are illustrated graphically for the Sacramento-San Joaquin estuary, include the fluorometer calibration and the ratio of chlorophyll to primary productivity and to phytoplankton standing crop. The preliminary data collected in the Sacramento-San Joaquin Estuary indicate that the relationship between fluorescence and chlorophyll concentrations can be defined. This relationship can be applied to any surface water situation calling for a quantitative estimate of phytoplankton population and phytoplankton activity. Chlorophyll was found to be a good indicator of eutrophication through relationships with phytoplankton and photosynthesis.

67-0652

Balden, A. R. The disposal of solid wastes. Industrial Water Engineering, 4(8):25-27, Aug. 1967.

The methods of ultimate disposal of solid wastes are reviewed along with their application to the handling of oily sludges and paint wastes in the automotive industry. The methods of ultimate disposal in which a potential contaminant is made innocuous or removed from possible contact with ground waters include: subsurface storage in cavities or impervious strata; conversion to innocuous compounds by oxidation or other chemical reaction; surface storage in sealed isolated ponds; disposal in the ocean; and conversion to useful products. The conversion to innocuous compounds which would include incineration offers the most promise for the automobile manufacturer whose two chief wastes are oily sludges and paint overspray. The illustrations include a picture showing oil and water mixtures in two phases and also three phases with an emulsion, in addition to the oil and water. Also shown is a belt skimmer for removing oil from water surfaces and a drum skimmer for removing free-floating oil from primary treating tanks at a purity of 95 percent or better. Schematic drawings are given of nozzle type, fluid bed, and pit incinerators. In the incineration of oily sludges from the treatment of the emulsions, the variables include the mixing of the waste with auxiliary fuel, the economics of flame versus fluidized bed incineration, and the nature of the gaseous exhausts. The pit incinerator offers promise in the disposal of paint wastes.

67-0653

Banda, E. M. Sewage reclamation for steel mill processing. Southwest Water Works Journal, 49(1):28, 30, Apr. 1967.

The sewage water treatment plant of Compania Fundidora de Monterrey, S.A., is discussed. Fundidora's steel-making area pumps a flow of 1,200 gal per minute from deep riverside wells, while the flat rolled products plant obtains its water from the sewage water plant, which has a 2,000 gal per minute capacity. Specified lists indicating new installations required by both steel plants include blast furnaces, open hearth furnaces, various types of mills, and a 22,000 kw turbogenerator that will increase the power plant capacity to 66,000 kw. All this equipment will require water provided by the new sewage plant. Water flows by gravity from the inlet to the reservoir of recirculation, where it is sent through two plain sedimentators and then to the primary sedimentation tank, which has a volume of 200,000 gal, and a retention time of one and a half hours. The solids are separated in this tank according to density, and the lightest and heaviest wastes are removed, while the others remain with the water to mix with activated sludge from the secondary sedimentation tanks. The mixed liquor is then sent to two aeration tanks, each with a half-million-gallon capacity and a 2½ hr retention time. In the secondary clarifers the activated sludge settles to the bottom. The sludge can then be sent to the primary-effluent canal, the sewer, or the sedimentation tank; the final operation is the chlorination of the effluent. The plant will eventually increase its capacity to 4,750 gal per minute and employ the 'Contact Stabilization Method.'

67-0654

Beidler, E. A., M. R. Fulmer, and G. F. Sachsel. Chemical reduction processes. In Status of unit operations and processes for solid-waste disposal; final report. Columbus, Battelle Memorial Institute, Feb. 19, 1967. p.83-160.

Chemical processing data for disposal of solid wastes were obtained by searching the literature and collecting information from State health departments. There are not many commercial applications of chemical processes for treating solid industrial wastes. Most industries burn wastes in open dumps and accumulate solid wastes in spoil areas. The chemical processes described in the literature are briefly reviewed. A summary of correspondences with State health departments reveals that States have little information on kinds and amounts of industrial wastes and their disposal. Eleven States do not have any legal authority in the matter of waste disposal, private or municipal. Incineration is the only chemical method practiced at present for the disposal of municipal wastes. Data are included on size and analysis of fly ash and capital and operating costs of incinerators. Methods of waste heat recovery and performance of heat-recovery systems are described.

67-0655

Bender, R. J. Solid-waste disposal in chemical plants. Power, 111(3):65, Mar. 1967.

Results of a survey based on 46 questionnaires which were returned out of 195 sent to chemical companies are presented. Interviews were also held with equipment manufacturers. Very few chemical companies use incinerators for disposal of wastes. Most plants haul away the refuse. When solid waste is burned, it is on a grate or in an open pit without provision for cleaning the gases. The disposal system is well-designed in larger plants where valuable products can be recovered. No recovery of heat for generation of steam was reported in the United States, but waste boilers with a steam generation of 10 lb of 80 psi steam and 2.5 lb of 200 psi steam, per lb of waste, were reported in France and Japan, respectively. Because too little waste is generated, or the production is 'batchy', many chemical plants cannot justify installation of an elaborate heat recovery system. These companies should use a municipal incinerator, with capability for generating usable power.

67-0656

Benedek, P., and I. Horvath. A practical approach to activated sludge kinetics. Water Research, 1(10):663-682, Oct. 1967.

The study was initiated to determine whether basic relationships developed for a continuously fed complete-mixing reactor and the enzymekinetic reaction model also apply in practice, and if so, with what limitations. On the basis of a closed (recirculating) continuous flow activated sludge system, which is schematically illustrated, basic relationships and five basic assumptions limiting their validity have been described. On the basis of hydraulics and mathematical statistics it is easy to detect the deviations between actual and theoretical conditions, which are usually the consequences of oversimplification in converting theoretical speculation to practical operation. The three main subjects considered along this line are: computed and actual detention times related to both liquid and solid phases (sludge age); the effect of the sludge mass outside the aeration tank; the limiting BOD or COD concentration in the effluent, determining at least two sets of rate constants. The experiments carried out led to the conclusion, that the enzyme kinetic concept is useful in the actual conditions of waste treatment, if the above three main points are adequately considered.

67-0657

Benjes, H. H., and R. E. McKinney. Specifying and evaluating aeration equipment. Journal of Sanitary Engineering Division Proceedings, American Society of Civil Engineers, 93(SA6):55-64, Dec. 1967.

An uncomplicated approach to the specification and field evaluation of aeration equipment is described, with an application of this approach to a complete mixing activated sludge plant. The waste water treatment plant to be constructed at Grand Island, Nebraska, was used as a test unit. A schematic diagram of the plant is presented and design criteria and unit sizes are tabulated. The direct reading oxygen probe, standardized against the Winkler method for dissolved oxygen, was specified as the equipment to be used in the performance tests, and the test procedure is described in detail. Tabulated data are presented, showing the calculated dissolved oxygen concentrations at varying oxygen uptake rates and temperatures, as well as aeration test results obtained in the field at Grand Island. It was concluded that: (1) Aeration equipment should be specified on a performance basis. (2) These performance specifications should permit the engineer to evaluate the treatment system at less than design loadings and at various temperatures. (3) Design specifications should indicate all operation parameters, such as air flow rates, temperature, MLSS, oxygen demand rates, and the desired DO level. (4) Methods for analyses as well as sampling times and points should be clearly defined in the specifications. (5) Results obtained from perfomance specification of aeration equipment will result in improved understanding of aeration equipment and will help dispel current confusion with regard to manufacturers' claims on oxygen transfer.

67-0658

Better phosphate removal. American City, 82(1):28, Jan. 1967.

Of the three activated sludge plants of similar design which treat sewage in San Antonio, Texas, two removed no more than a trace of the phosphates while the other consistently showed phosphate depletions in the effluent of up to 90 percent. A study conducted by researchers from the Water Pollution Control Administration showed that changing five of the operational features of one of the plants that had been removing no phosphate resulted in phosphate removal of up to more than 90 percent. The changes were: increase in aeration; increase in the concentration of bacteria; reduction of the settling period; decrease in the time that settled materials remained in the settling tank; increase in the ratio of bacteria to organic materials. Removal might be the result in one or several or all of the changes, and tests along this line are continuing. These experiments may also point the way to increased phosphate removal in other types of plants.

67-0659

Bittman, M. Dehydration and decomposition of chemical sludge with the aid of plants. Wasser und Abwasser, 108(18):488-491, May 1967.

In the drying process, hydroxide-containing sludges very soon form a densely closed, relatively small surface which prevents further evaporation of water. To make the drying process more successful, the sludge was spread out onto reed (Phragmites communis) beds, approximately 21 m long, 2.5 m wide, and covered with plastic foil. Both beds were filled with sand to a height of 40 cm into which 500 young reeds were planted. For three weeks they were watered with ordinary water from the mains. Then the sludge which had a solids content of about 10 percent on the average was spread over the two beds. A table gives the detailed composition of the sludge used. First, a layer of 20 cm in height was spread out across the sand. Within the following 4 to 5 weeks three more layers were added. Within the testing period of about 4 months, the uncovered bed received approximately 6.8 cu m of rain water while the covered bed received only a small amount of rain blown in from the sides. The reeds were not hampered in the growth by the sludge and they prevented the formation of a dense and closed sludge surface and permitted a fast drying by evaporation. Moreover, the plants extracted the water from the lower layers of sludge. The covered bed showed a much lusher vegetation and more cracks were formed. Results of water analysis are tabulated. (Text-German)

67-0660

Bramer, H. C. Key to clarifier design. Industrial Water Engineering, 4(7):24-25, July 1967.

Since the design procedures used in sanitary engineering practice are not applicable to most industrial waste sedimentation problems, this article outlines methods developed for such applications. In sedimentation basins for industrial wastes treatment which handle relatively high flow rates of suspensions of dense solids or are intended to clarify suspensions of very fine particles, the effluent clarity is of prime concern. The performance of a sedimentation basin can be rated in terms of the 'critical particle' or the smallest particle which will settle out of suspension in the basin. The performance can also be defined in terms of the settling time required in an empirical test in the laboratory to duplicate the effluent concentration of a given basin, and the value determined is called the sedimentation index. Equations are given for use in sedimentation basin design for calculating the critical particle from Stoke's Law, for the design of basins of any sort for handling discrete particles, and simpler equations for the design of rectangular basins of the type most used in industrial waste treatment. Charts are also given showing the sedimentation index plotted against the superficial linear velocity and corrections for the sedimentation index for various inlet conditions. The equations and graphs given should not be used for other than preliminary calculations without a study of the indicated reference material and apply only to simple rectangular basins and suspensions of discrete particles.

67-0661

Bruskotter, J. W. and M. L. Weimer. Pollution control for the laboratory. Research/Development, 18(11):30-33, Nov. 1967.

The evolution of the waste disposal system at Marathon Oil Company's Denver Research Center is described. Previous disposal methods involved the collection of waste materials in 50-gal steel drums. About once a month petroleum light-end products were dumped into an open pit and burned. However, problems included complaints from nearby residents and air pollution hazards. In addition, the heavier materials, which could not be easily ignited for burning, were hauled to the community dump in their drums. The possibility existed that someone might inadvertently introduce some chemical that could produce an explosive condition within the drum. The solution consisted in purchasing a Prenco pyro-decomposition system, designed to dispose of both light- and heavy-end waste products, without contributing to air pollution, at a cost of $10,000 capital investment. The equipment installed, a standard model SF-1, designed to utilize fuel oil as an auxiliary with a capacity to dispose of fluidized waste materials at a rate of 3,360 gal per week, is described. A diagram of the system and an account of its operation is given. With the Prenco equipment, waste disposal is efficient, clean and safe. There is no smoke, odor, or visible ash, and waste products are completely consumed.

67-0662

Bucksteeg, W. Elimination of inorganic waste material. Wasser und Abwasser, 108(36):1018-1021, Sept. 1967.

When depositing metal hydroxide sludges on ground which is water permeable, danger of polluting the groundwater exists; but not much is known about how great the danger really is. Experiments were therefore conducted to obtain information on the dissolution by rain water of non-ferrous metal sludge. In the first experiment a glass tube, 2 m long and 10 cm in diameter with an outlet at the bottom, was filled with a layer of sand 120 cm thick and slightly compacted. On top of this layer, 25 cm of soil was placed, followed by 55 cm of a mixture of crushed garbage (3.5 liters) and hydroxide sludge (0.8 liters). Distilled water with varying carbon dioxide content was continuously sprayed over the test layers. In a second test, glass tubes of 4 m in height and 11 cm in diameter were filled with 50 cm of gravel, 175 cm of sand, 75 cm of soil, and 88 cm of a mixture of 5.5 liter waste and 2.8 liter metal hydroxide sludge and were subjected to rain with a carbon dioxide content of 5 mg per liter. The waste used in this experiment came from a composting plant operating according to the Dano method. In general, it was found that the groundwater is polluted mainly by organic substances and nitrogen-containing compounds. Manganese is dissolved in great amounts through the decomposition of organic material. Very small amounts of the metal hydroxide were washed out from the sludges. (Text-German)

67-0663

Burns, O., and J. Mancini. Disposal system for mixed primary and secondary sludges. Tappi, 50(1):99A-104A, Jan. 1967.

Disposing waste solids by lagooning is found no longer acceptable because the supernatant liquid from the lagoon has become a source of high BOD waste which overloads the activated sludge waste treatment plant and, therefore, prevents adequate protection for the river. Studies conducted to develop another disposal system for the paper and pulp mill industry are reviewed. Aims of the study included: the design of a new disposal system; eliminate or reduce the BOD of the waste discharged from the lagoon; avoid another lagoon system if possible. The project included pilot plant investigation of gravity thickening, centrifuging, vacuum-filtration, and screw-pressing. Laboratory experiments were conducted on anaerobic and aerobic digestion and air flotation. Results show that a decrease in BOD in the waste treatment plant effluent of 3,000 lb per day (in winter) and 35,000 lb per day (in summer) can be achieved. The proposed system would include partial gravity thickening, vacuum filtration, experimental pressing, and incineration in bark boilers. A new fly ash lagoon is provided.

67-0664

Cardinal, P. J. The incinerator's role in sludge disposal. American City, 82(12):108-110, Dec. 1967.

An analysis of the actual operating results of the sludge handling facilities at the expanded East Rochester, New York, water-pollution control plant is presented. This 1.0 million-gal-per-day facility, serving 8,000 people, consists of a primary clarifier and trickling filter, preceded by the normal screening and frit-removal facilities, and produces approximately 2,000 lb per hr of filter cake, containing approximately 25 percent to 28 percent solids. A belt conveyor feeds this cake into the BSP incinerator. The hive-hearth incinerator has an outside diameter of 10¾ ft. The cake will normally burn without fuel and the high furnace temperatures, in excess of 1,500 F, completely destroy the organic matter in the sludge cake and reduce it over 95 percent by weight. An induced draft fan draws the products of combustion through a cyclonic jet scrubber that cools the gases from 700 F to 175 F. The scrubbed stack gases contain less than 0.20 lb of particulate matter per 1,000 lb of stack gas, which is considerable cleaner than the 0.85 lb specified, and they are odor free. Tabulated data, which give present plant operating costs and estimated costs when operating at maximum capacity, show that the total cost per ton of dry solids at present is $5.87, and future costs are estimated at $3.50. Improved vacuum-filter design has greatly lessened the cost of filtration and stimulated the use of incineration. The furnace operation is described in detail and improvements and costs of sludge furnaces at various plants are detailed. It is concluded that better equipment, lower cost and manpower requirements, and the absence of smoke and odor, promise to increase the incinerator's role in sludge disposal.

67-0665

Cartwright, P. E. Chemical waste and soluble oil treatment for a metal working plant. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.1-4.

An insight into the manufacturing operations of an Ypsilanti, Michigan firm, producing automatic transmissions for automobiles, is given as well as the methods used to treat its oil-contaminated waste water. The oily waste waters are pumped from the plant and collected in a 200,000-gal holding tank which is located out of doors and has a two-day capacity. The waste is pumped from the holding tank in batch quantities into the reaction tank where precise quantities of sulfuric acid and aluminum sulfate are added. Oil which separates is skimmed off and sold to an outside firm which reclaims it for commercial uses. Chemical waste water is treated in two large clarifier tanks. Any oil still present is returned to the oily waste water system for reprocessing. The solids that collect in the bottom of the clarifiers are pumped to two 50,000-gal sludge thickening tanks where they are worked to settle the solution into a heavier sludge. It is then pumped into two vacuum filters which dry and separate the sludge into pellets which are conveyed into a truck for haulaway to a proper dump site. Difficulties which were encountered with tearing of the nylon filter cloth on the vacuum filters for the sludge disposal system and with a poorly designed oil skimmer on the clarifiers have been corrected.

67-0666

Central waste-disposal unit set at Houston. Oil and Gas Journal, 65(49):41, Dec. 4. 1967.

A plant, which is planned for construction in June 1968 on the Houston Ship Channel by a group of Houston pollution control and processing experts, is described. It is designed to dispose of burnable industrial wastes, and the only 'products' will be clean industrial landfill and steam. Gaseous products from the wastes will be exhausted into the upper atmosphere through a 400-ft high stack. During operations, the wastes will be selectively blended in the plant and then fed to the proper oxidation unit—either rotary kiln, multiple hearth, or rotating grate. Natural gas will be used to burn off volatiles in the first step. Complete combustion will be accomplished in the second step with temperatures over 1,800 F. More than 100,000 lb per hr of product steam will be recovered and sold along the ship channel. A multiple stage electrostatic precipitator will be used to reduce particulate matter prior to discharge of the exhaust gases through the high stack. Foster Wheeler water-wall furnaces and Nichols Engineering & Research combustion and processing equipment will be used. The plant, which will cost $5 million, will process 10,000 tons of waste per month.

67-0667

Centrifugal dewatering aids waste handling problems for southern mill. Paper Trade Journal, 151(36):39, Sept. 4, 1967.

The 40-million gal of liquid effluent coupled with no space for adequate lagoons has created a major disposal problem for a large southern paper mill which produced 1,000 tons of pulp, 1,250 tons of paper and paperboard, 100 tons of caustic soda, 27 tons of tall oil, 1,100 gal of turpentine, and 90 tons of chlorine per day. The treatment plant features three 40 by 60-in. Solid Bowl Centrifugals made by BirMachine Co. with a combined capacity of 300 gal per minute of sludge from the underflow of three clarifiers. The dewatered sludge in the form of a 29-percent solid cake drops from the centrifuges through hoppers onto a conveyor to a dump slab for storage until it can be hauled away to landfill. The effluent water from the centrifuges which still contains some solids is returned to the clarifiers for resettling. A schematic flow sheet is given which traces the progress of the waste water through the screens, clarifiers, and centrifuges. There is also a photograph of the paper primary waste treatment plant. While the primary plant has gone a long way to reduce the stream pollution by reducing the oxygen-consuming organic material from the discharged water, the addition of a secondary system with mechanical aeration to permit bacterial action on dissolved and minute suspended organic solids with more centrifuges to dewater the resulting sludge is being considered. The Solid Bowl Centrifugal has a rotating bowl in which settling action takes place and a slower moving scroll conveyor which discharges the dewatered solids. Experience has been satisfactory for three years.

67-0668

Centrifugal dewatering helps handle peak loads. Water and Sewage Works, 114(10):383-384, Oct. 1967.

During the canning season from August through October, the peak load of digested sludge from waste systems carrying 8 million gal per day from the town of San Leandro, California, with a population of 65,000, has a BOD population equivalent of 300,000. Industrial waste of 3 mgd. and domestic waste of 5 mgd. are delivered to the plant by separate systems and treated separately. The use of two solid bowl centrifuges, one 24 by 60 in. and one 40 by 60, in dewatering the digested sludges is described. A picture is shown of the 40 by 60 centrifuge, installed in 1957, which dewaters industrial waste during the canning season. Another picture shows the 24 by 60 solid bowl centrifuge which dewaters 21,000 gal of primary digested sludge. The 25 cu yd per day of cake, with 25 percent solids, are loaded into municipal trucks for use as landfill. A flow sheet is given showing the parallel treatment of industrial sludge for 10 hr a day 6 days a week during the peak cannery period. The 40 by 60 centrifuge solved the problem of three plant digesters going sour from handling canning and paper mill waste along with domestic sludge in the same digesters. The effluent from both the domestic and industrial sewage treatments is treated in a chlorine contact before discharging into San Francisco Bay. Contemplated expansion provides for further biological treatment facilities and a new digester or incineration plant.

67-0669

Chakrabarty, R. N., A. Q. Khan, and H. Chandra. Activated sludge treatment of tannery waste. Journal of the American Leather Chemists Association, 62(11):733-746, Nov. 1967.

Experiments were conducted on activated sludge treatment of settled tannery waste in admixture with sanitary sewage in a continuous bench scale plant. A diagram is given of the laboratory scale activated sludge unit which was used. Prior to the collection of data, the activated sludge was acclimatized to tannery waste to avoid the lag period in the removal of BOD from the system. The proportion of tannery waste in the sanitary sewage-tannery effluent mixture was raised from 2 percent to 30 percent and the mixed liquor suspended solids from 1,500 mg per liter to 5,500 mg per liter. The characteristics of the tannery waste and the feed to the aerator showed that the BOD-nitrogen ratio of the substrate was properly balanced for aerobic oxidation. It was found that a steady growth of sludge occurred from the beginning of the aeration period and that the volatile matter in the sludge increased from 65 percent to about 85 percent within a period of 30 days. Between 0.6 and 0.75 lb of volatile suspended solids were produced per lb of BOD removed. The BOD removal was found to be about 95 percent at a BOD loading of 0.5 lb per day per lb of sludge. At higher than 1.2 lb of BOD loading the efficiency declined considerably. The relationship between the aeration period and BOD removal efficiency showed that with a BOD-MLVSS ratio of 0.24 the BOD removal was about 90 percent with 7-hr aeration. The oxygen requirement of the system was found to be high, especially because of the presence of a large concentration of tannin. It was concluded that tannery waste could be satisfactorily treated by the activated sludge process and that the values of the different parameters showed good agreement with those obtained on treatment of domestic sewage and other organic industrial wastes. However, since the oxygen requirement was found to be quite high, if the bulk of the tannin could be removed from the waste, more economical treatment could be effected.

67-0670

Chalmers, R. K. Treatment of wastes from food manufacture and coffee processing. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.866-878.

A waste treatment system was set up by a food manufacturer in Great Britain to comply with the conditions of acceptance of trade effluent into the public sewers of the small town of Banbury. In the investigation of activated sludge treatment of coffee wastes it was found that pre-treatment by flocculation and sedimentation was desirable and addition of phosphorus and nitrogen-containing nutrients was necessary. Foaming and fungal growths were major problems. A trickling filter experiment and investigations of physical treatment were carried out. Conditions were established for satisfactory operation. While treatment by activated sludge was possible, the process was liable to upset by shock loads and there was a substantial sludge disposal problem. Pre-treatment by physical means by screening, centrifuging, filtration, evaporation of selected strong liquors, and incineration offered clear advantages in: costs, use of familiar processes, use of waste heat available from burning of waste products, reduction in effluent volumes, and variability in the load selected for evaporation. The original design flow of 25,000 gph was reduced to 7,900 gph by recycling of cooling water and some reduction in excess flows. After the introduction of further water conservation techniques and revised cleaning methods the trade effluent amounted to 4,113 gph with 5,910 lb BOD per day. Operating data and performance costs are listed.

67-0671

Chatfield, H. E., R. J. MacKnight, S. T. Cuffe, et al. Chemical processing equipment. In Air pollution engineering manual. Public Health Service Publication 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967. p.681-806.

Chemical processes and equipment described are: resin kettles, varnish cookers, sulfuric acid manufacturing, phosphoric acid manufacturing, paint baking ovens, soaps and synthetic detergents, glass manufacture, frit smelters, food process equipment, fish canneries and fish reduction plants, reduction of inedible animal matter, electroplating, insecticide manufacture, hazardous radioactive material, oil and solvent refining, and chemical milling. Air pollution problems, hooding and ventilation requirements, and air pollution control equipment are discussed for each process. Many flow diagrams and photographs are used to show the manufacturing processes.

67-0672

Cheese waste disposal studies. Public Works, 98(11):120, Nov. 1967.

A demonstration project, partly funded by the Federal Government, is being conducted at Selfridge, North Dakota, in an effort to develop an economical method of treatment and disposal of cheese waste or 'whey'. The largest cheese plants process about 100,000 lb of milk per day and produce a 5-day BOD total of about 3,600 lb per day. Due to the low pH and high BOD, the State water quality standards prohibit discharge into a water course, lagoon, or other disposal facility. In this project, being conducted with the cooperation of the village of Selfridge and a local cheese company, the primary cell of the cheese company lagoon is about 10 ft deep and is aerobic. Discharge from the anaerobic cell will be combined with effluent from the Selfridge lagoon in the second cell of the cheese company plant. This cell has a very low liquid level and transferring liquor from the Selfridge lagoon is expected to provide desirable detention and a better operating level.

67-0673

Clough, G. F. The implication of effluent standards in setting up chemical manufacturing units. Effluent and Water Treatment Journal, 7(6):321-323, 325-326, June 1967.

An outline is given of the factors involving effluent disposal which should be considered at the process and/or selection stage in setting up chemical manufacturing units. In the disposal of non-aqueous liquid discharges, the possibilities include recovery, burning, or disposal to a waste specialist. Aqueous effluents may be discharged to the sea, to a water course, or to a local authority sewer. Treatment before discharge to a sewer or water-course may be required with the requirements for discharge to a water-course being more stringent. The standards for gaseous discharge are likely to be less severe than for a site in a residential area. Solid effluents are normally dumped, but recent regulations governing the discharge of effluents to underground strata will complicate this method. The cost of the large area of land for effluent treatment plants must be considered in the cost. Suppression of odor, dust, foam, and noise must be considered in residential sites. Process changes may lower effluent disposal costs, such as the substitution of hydrochloric acid for sulfuric in metal pickling, or the use of hydrogen peroxide for sodium hypochlorite in bleaching. A restricted site and a low power cost would favor an activated sludge system, plenty of level space would favor lagoon treatment, while high power cost favors a percolating filter. The subject of effluent treatment is so complex that because of the interacting factors it is difficult to formulate any general rules, and each case must be considered on its merits by an expert.

67-0674

Control and Disposal of Cotton-Ginning Wastes; a Symposium, Dallas, May 3-4, 1966. Public Health Service Publication No. 999-AP-31. Cincinnati, U.S. Department of Health, Education, and Welfare, 1967. 103 p.

The symposium on the problems of cotton-ginning wastes was sponsored by the National Center for Air Pollution Control of the Public Health Service and the Agricultural Engineering Research Division, Agricultural Research Service, U.S. Department of Agriculture. Technological changes in cotton harvesting and cotton ginning and wider use of pesticides, dessicants, and defoliant chemicals in cotton production suggested the need for the conference. The proceedings contain information on the following subjects: the roles of the state extension's gin mechanization specialists; methods employed in harvesting cotton; operations and characteristics of the cotton gin; trash disposal practices; methods of collecting lint cotton trash; air pollution study of cotton gins in Texas; trash collection and disposal system; design and operation of the in-line filter; consideration for determining acceptable ambient and source concentrations for particulates from cotton gins; and recommendations for needed research and development.

67-0675

Cope, J. H., and A. L. Lingard. Economic values from (I) mine dumps in the Black Hills, South Dakota, and (II) lignite ash from power plants. In Engineering Foundation Research Conference, Solid Waste Research and Development, Milwaukee, July 24-28, 1967. Conference Preprint No. B-11.

Material from mine dumps in South Dakota is estimated to be in excess of a million tons. This study will investigate 2 to 4 of the larger mining properties. Each site will be surveyed to determine the tonnage of dump and tailings material present. Representative samples will be analyzed and metallurgical investigations made to determine the economics of extracting the minerals present as well as considering the overall use of the dump material for various purposes. Also, lignite ash from Montana-Dakota utilities companies will be investigated to determine the possibility of metals recovery from the ash; the possibility of utilizing the minerals as agricultural material without separation from the ash; and the possible use of the bulk material in aggregate, concrete, agriculture, and construction materials. Major emphasis will be on analysis of the ash for metals content and on methods of extracting or solubilizing the metals present. Various proposed methods are listed.

67-0676

Cremean, W. J. Sewage treatment program with an eye to the future. Public Works, 98(11):96-97, Nov. 1967.

The activated sludge sewage treatment plant in Columbus, Ohio is described. Operational on August 14, 1967, this new plant has an initial design capacity of 60 mgd and will provide 95 percent treatment. The screen and pump building are designed for a future capacity of 180 mgd, while the present screen and pump installation has a capacity of 120 mgd. Due to the rapid growth of the service area, expansion will be needed, and is planned for 1969. Raw sewage enters a screen channel and trash rack to remove large objects, then passes through a 1 in. vertical bar screen. Processing continues through grit tanks, aeration tanks, settling tanks, and digesters, followed by secondary treatment in aeration tanks. Clear liquid from the final settling tanks flows to chlorine tanks for tertiary treatment before being discharged into the Scioto River. Sludge is concentrated and digested, then incinerated. Sludge gas from the digesters contains about 65 percent methane, which can be used as supplemental fuel for the incinerators.

67-0677

Danielson, J. A., K. D. Leudtke, E. F. Spencer, et al. Metallurgical equipment. In Air pollution engineering manual. Public Health Service Publication No. 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967. p.235-321.

Control devices and the air pollution problems encountered in steel, iron, brass, aluminum, zinc, lead, and metal separation processes are discussed. Processes related to metallurgical operations such as manufacture of sand cores, foundry sand-handling equipment, and heat treating systems are also covered. The common furnaces and their principles of operation are briefly described. These furnaces are: the reverberatory furnace, electric furnace, crucible furnace, and the pot furnace. In the steel manufacturing processes air pollution problems, hooding and ventilation requirements, and control equipment for the open hearth, electric-arc and electric-induction furnaces are presented. In the iron casting, brass-and bronze melting, aluminum melting, zinc melting, lead refining, and metal separation processes, the same topics are covered for the process furnace utilized. Also, the same subjects of air pollution problems, control equipment, hooding and ventilation requirements are treated for core ovens, foundry sand-handling equipment, and heat treating systems.

67-0678

A design plan for public conveniences. Public Cleansing, 57(2):71-73, Feb. 1967.

A recent issue of 'Design', a monthly journal, contained a report on the shortcomings of public lavatories in Britain. Ideally, a public lavatory should be: sited where needed; properly signposted; easily and safely accessible; well planned internally; equipped with efficient, economical fittings; vandalproof; hygienic; and well maintained. Public lavatories are needed in all large public areas, in long-distance coaches, and at frequent intervals along highways. A standard sign, internationally recognized, should be introduced to indicate lavatory facilities. Entrances should be wide, lit at night, affixed with hours, near a parking space, and available in equal numbers to men and women. Facilities should have non-slip floors, shelves for parcels, mirrors, sound-proofed walls, one larger cubicle for the elderly, plunger spray taps on wash basins, and new flushing mechanisms. Attendants should be full time and organized into mobile patrols. Lavatory facilities must be constructed so that vandalism is not easy. However, most precautions must be taken in relation to hygiene. Among these are sanitary towel disposers, lavatory fans, and footpedals to open doors and to flush the lavatory.

67-0679

Dick, R. I., and B. B. Ewing. Evaluation of activated sludge thickening theories. Journal of the Sanitary Engineering Division, Proceedings, American Society of Civil Engineers, 93(SA4):9-29, Aug. 1967.

Prevailing thickening theories cannot be strictly applied to activated sludge, and interparticle forces probably account for the deviation from current theory. The extent of the deviation can be evaluated by the retardation factor and the ultimate settling velocity. Thus the Kynch theory is valid for 'ideal' suspensions and accurately describes their behavior, but is not valid for activated sludge. In addition to being dependent upon concentration, the rate of subsidence of activated sludge is dependent upon sludge depth and the mixing of underlying layers. This is true at concentrations less than that of the 'compression point.' The area required to accomplish thickening in a settling tank is not fixed by the observed settling velocity of the rate-limiting concentration of sludge, as has been assumed. According to prevailing theories, depth and manipulation should alter the volume required for compression, but should not change the solids handling capacity of a suspension. Relationships between sludge depth, settling velocity, and retardation factor are analyzed. The retardation factor can be related to the general nature of activated sludge, with low factors associated with sludges of good settleability and high factors with bulking sludges. The retardation factor and the ultimate settling velocity would be useful parameters for evaluating the effect of biological variables upon the settleability of activated sludge.

67-0680

Dillon, K. E. Waste disposal made profitable. Chemical Engineering, 74(6):146-148, Mar. 13, 1967.

A process is described in which industrial mine water with a high acid content, ordinarily a troublesome industrial waste, is used to clean raw coal. The raw coal used in the coal-preparation plant at Marianna, Pennsylvania, has 30 percent calcium and magnesium carbonates which is sufficient to neutralize the mine water which has a pH of 3.0. The acidity is 4,340 ppm expressed as calcium carbonate and there is an iron content of 551 ppm. The discharge after neutralization has a pH of 6.7 to 7.1 and an iron content of 0 to 1 ppm which is well within the limitations of the Pennsylvania Sanitary Water Board. The crushed raw coal and mine water are mixed with recycled middlings and sludge on a jig assembly in the presence of air. The agitation tends to maintain the pH in excess of 6.9 which is required to produce ferric iron which produces the flocculent sludge with good settling characteristics which becomes a part of the refuse. The process continues with an elaborate system of desliming, froth flotation, clarifying of wastes, and dewatering of the coal. The process does not require the purchase of raw chemicals, and there is no corrosion problem because of the immediate neutralization of the acid mine water.

67-0681

Disposing of waste from the country cottage. New Scientist, 36(572):483, Nov. 23, 1967.

An integrated purifier unit, known as the Clivus system and designed primarily for the small country house far from the sewer system, is described. Organic waste is left to decompose by bacterial action to produce an unobjectionable humus which can be used as fertilizer. Organic waste falls through a garbage chute from the kitchen and from a special waterless toilet into a decomposition chamber made of reinforced plastics. Air enters the container through several openings and an exhaust duct extends to above roof level to take away waste gases. Gentle decomposition takes place, producing humus after a fairly lengthy interval. A household of 5 or 6 people will provide enough waste to make a few bucketfuls of humus a year. The system is said to be odorless in operation and comparatively inexpensive to operate.

67-0682

Domanski, J. Research on the thickening and drainage of sludge beds from tannery coagulated sewage. Gas, Woda I Technike Sanitarna, 38(11):362-366, 1967.

Sewage from tanneries is especially odorous. Basically, the same operations must be undertaken to obtain any kind of clarified sludge, (i.e. thicken the sewage, drain it, and dry it). Only the burning of the dried material remains. As the coagulated material is high in chromium, hydrogen sulfide, ammonia-nitrogen, and organic nitrogen (analysis presented), 1- to 5-liter laboratory experiments were undertaken and repeated with large settling tanks. Mixing and settling times were observed for the purpose of precipitating the sludge in layers so that valuable materials could be recovered and the recovered water could be fed into the general water reuse mains. By repeated stirring and settling, the desired aim was accomplished in 20 days. In the large-scale experiments, the moisture influenced the results greatly. In July a complete settling and drainage was easily achieved because 351.5 mm of rain was deposited on the sludge bed, compared to 59.9 mm for September. (Text-Polish)

67-0683

Downing, A. L., and J. D. Swanwick. Treatment and disposal of sewage sludge. Institution of Municipal Engineers Journal, 94(3):81-86, Mar. 1967.

The treatment and disposal of sewage sludge in Britain is reviewed in the light of the increasing amounts and difficulties resulting from a 4 percent increase in volume and the new processes under development. Approximately one-fifth of the sewage is piped directly to the ocean or in some cases, the solids after settling are dumped at sea from sludge vessels. For inland communities the most common method of disposal is anaerobic digestion of the sludge, dewatering of the digested sludge on open drying beds, and the disposal of the sludge on agricultural land. The next most important method consists of filter-pressing the primary and secondary sludges followed by disposal on land. The use of digester gas as a source of power is considered, based on combustion of the 70 percent methane evolved. However, with increasing plant and operating costs and the stable price of electricity, coupled with an increasing incidence of digestion failure due to toxic substances in the sewage, and the increasing availability of power from natural gas and nuclear sources, the arguments for the use of digester gas are less compelling than formerly. Although an intensive development is now in progress in the United States for the combustion of sludges, no full scale combustion process has operated in Britain at a cost competitive with the traditional methods. The present capital investment in the traditional methods is so large that it is unlikely there will be any rapid change to other processes which offer little in savings and have their own operational problems.

67-0684
Easton, J. K. Electrolytic decomposition of concentrated cyanide plating wastes. Journal of the Water Pollution Control Federation, 39(Part 1)(10):1621-1625, Oct. 1967.

The process of electrolytic decomposition is studied for use with concentrated cyanide plating wastes. Reactions which take place during the electrolysis process are described. Necessary equipment includes a steel tank, anodes, electrical power, steam coils, controls for heat, and an exhaust system. The colorimetric procedure for determining cyanide content is described. Tables are presented which include the operating conditions under which production runs were carried out, the results of a series of decomposition runs with high-carbonate solutions, the results of a series of decomposition runs on a different type of cyanide solution containing sulfides, the increase in sodium carbonate and the decrease in pH as the solution is electrolyzed, and decomposition costs for 2,000 gal of cyanide solution. It was concluded that the electrolytic decomposition of cyanide solutions is practical and economical with strong concentrated baths but not with rinse-water wastes. The advantages of electrolytic decomposition include simple equipment and operating conditions which are familiar to the electroplater. Initial solution concentration is of little consequence and the cyanide is destroyed without the formation of other toxic compounds. Metal from the solution can be reclaimed and used as anodes or sold for scrap. After removal of heavy metals, chlorination can be carried out without interference from metal complexes.

67-0685
Eckenfelder, W. W. Comparative biological waste treatment design. Journal of the Sanitary Engineering Division, Proceedings, American Society of Civil Engineers, 93(SA6):157-170, Dec. 1967.

Results obtained in this study and others have shown that the same formulations can be employed for the design of most of the aerobic biological waste treatment processes in use today. This enables the design engineer to develop comparative designs of various systems from a limited amount of data. The variables influencing design are discussed and tabulated for 4 types of design. These variables include rate of BOD removal and resulting effluent quality, oxygen requirements and resulting aeration power levels, excess sludge yield, nutrient requirements, temperature coefficient, and sludge yield.

67-0686
Eckenfelder, W. W. Mechanisms of sludge digestion. Water and Sewage Works, 114(6):207-210, June 1967.

The complex anaerobic conversion of organic solids to inoffensive end products is described in detail showing experimental data in chart form. A conventional high rate digestion system is simplified to basic, individual reactions under equilibrium operating conditions. The overall rate of reaction is assumed to be controlled by the rate of conversion of volatile acids to methane and carbon dioxide. Sufficient time to permit the growth of organisms needed for methane fermentation is discussed including the consequences of incomplete fermentation on pH and volatile acid concentration. Gas produced in a sludge digester from the breakdown of volatile acids is mentioned as a major end product.

67-0687
Effenberger, M. Purifying sewage under size-reduction. Gaz, Woda I Technike Sanitarna, 39(3):94-95, 1967.

The purification of sewage using size-reduction techniques is considered. Although sewage is generally considered a liquid, it contains sufficient solid particles of large size to make treatment difficult. An installation is described in which the sewage is accelerated and driven against successive filters on a filtering surface of 0.95 sq m for each batch of 6.27 cu m of sewage. Solids are ground to facilitate subsequent handling and biological digestion by organisms. After laboratory development, this method was tested for several years in a pilot plant. Treatment was considered satisfactory since the original sewage, having a BOD of 2,145 to 3,400 g per cu m, was improved by 35 percent within 3 to 4 hr. At the end of processing, 35 to 45 percent of the N had been removed, the solids had collected into flakes varying from 250 to 5,000 mu, and no large bacterial colonies were found. (Text-Polish)

67-0688
Electric incineration toilet.
Rohr-Armatur-Sanitaer-Heizung, 22(9):690, Sept. 1967.

An electric incineration toilet from Sweden has been introduced at the exposition of sanitary and heating equipment in Frankfurt, West Germany. Feces and urine are burned in an insulated combustion chamber, which eliminates odor and pathogens. The toilet covers a space of 125 by 90 cm. The installation of a ventilating duct is required and space must be available for installing the electrical facilities. The upper part is made of sheet steel with two enamel coatings. Prior to using the toilet a paper bag is inserted. When the lid is closed and the hand wheel next to the seat is turned the paper bag falls into the combustion chamber and incineration starts automatically. The ventilator is turned on. After complete incineration the heating elements turn off automatically, but the ventilator keeps running until the temperature in the combustion chamber is down to 50 C. (Text-German)

67-0689
Eliminating industrial odors. Water and Waste Treatment Journal, 11(5):243, Jan.-Feb. 1967.

The use of a blanket of plastic balls to control odor from waste collecting pits is described. A triple layer of Allplas plastic balls controlled the odor from an oil-water mixture in a collecting pit which accommodated all of the waste from an oil refinery before it went to a purifying plant to remove the oil before the water was discharged to the Rhine. The pit could not be covered because of the explosion hazard. The odor complaints were eliminated by the plastic balls which acted as a flexible vented lid.

67-0690
Enders, K. E., M. J. Hammer, and C. L. Weber. Field studies on an anaerobic lagoon treating slaughterhouse waste. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.126-137.

Studies were performed on anaerobic lagoon waste treatment units located in the countryside of northeast Nebraska. The processed waste waters, after recovery of edible and inedible by-products, are merged with the surface drainage from the holding yard and the cooling water. This combined waste flow is pumped to the lagoon treatment system consisting of firststage anaerobic lagoons, followed by intermediate and secondary aerobic lagoons. The waste water flow was measured at the effluent of the anaerobic lagoons using rectangular weirs and continuous operating flow recorders. The influent and effluent samples tested for BOD, COD, and solids were collected every 30 minutes and stored at refrigeration temperature. Sampling of the interior, the sludge, or liquid contents of the lagoon cells was done from a small flat bottomed boat. The waste load per head of beef slaughtered, for 3 days of 24-hr sampling, is tabulated. It was concluded that anaerobic lagoons for the first stage treatment of slaughterhouse wastes from abattoirs in rural locations are feasible. If designed in accordance with accepted practice, the lagoons have the capacity to handle shock loads and intermittent loadings without significant loss of treatment efficiency. The efficiency of BOD removal was greater than 80 percent. The solids buildup, given preliminary treatment for removal of paunch manure and recovery of by-products, appeared to be extremely low.

67-0691
Ethyl enters purification field with Flocor. Ethyl News, 33(2):11-12, Summer 1967.

Ethyl has moved into the waste water purification field with 'Flocor,' a plastic filtering media that helps turn sewage and industrial effluents into harmless carbon dioxide and water. Basically, 'Flocor' is corrugated plastic packing modules that operate on the principle of biological oxidation. However, the plastic packing itself is not subject to bacterial attack and is unaffected by most chemicals or weathering. 'Flocor' removes up to twenty times more waste per volume than conventional filters, and is far lighter in weight than its stone counterparts. Unlike heavy aggregate filters, these new units can be stacked easily, and the outside framing need be designed only to withstand wind pressure. 'Flocor' systems require only simple pumps to hold a few inches of water, and their ability to handle high hydraulic and organic loads mades them ideal for both municipal and industrial use. The effectiveness of 'Flocor' lies in its patented honeycombed configurations, which provide the largest possible surface area with the lowest bulk density. In addition, the large triangular voids will not clog no matter how great the flow of waste water.

67-0692

Ewing, R. C. Waste-treatment plant designed for industrial complex. Oil and Gas Journal, 65(11):106-108, Mar. 13, 1967.

A contract to build a million-gallon per day treatment plant using an activated sludge process is underway in Bayport, Texas. It will serve a 7,250-acre industrial complex which will produce 40 million gpd of liquid wastes, with a high level of organic pollutants. Industry minimizes volume by practicing in-plant conservation and separating surface drainage from the waste stream. Eighty percent of waste flow will be in the clean stream and 20 percent will require biological treatment. 'Clean' waste water has no floating organics or measurable toxicity and not more than 50 mg per liter BOD, 5 mg per liter oil, or 30 mg per liter suspended matter. The biological stream should keep the pH of water in the central collector between 5.5 and 9.5 and temperature below 130 F. Siphons carry the two waste streams under roads. After flowing to a holding pond, the clean stream is pumped to the disposal point. When sensors detect nonacceptable waste, the stream is diverted to Basin B for analysis and treatment. The Texas Water Pollution Control Board allows a nine-million-gallon waste discharge daily from Bayport. Estimated cost of facilities is more than $6 million. Clean stream charges will be for transportation primarily while biological stream charges will be based on strength and nature of waste. Nonacceptable wastes will be either pretreated by industry or contracted separately. Solid and exotic wastes can be disposed of by incineration, in landfills, at sea (costing $2 to $3 per ton), or in wells (costing $10 per 1,000 gal).

67-0693

Expo's genius spills over on one Quebec town. Civic Administration, 19(12):19, Dec. 1967.

The 'Expo 67' sewage system that combined completely mixed activated sludge, extended aeration, and ponding will be employed by a Montreal municipality. The plant removed 90 percent of the five-day BOD and suspended solids. One plant to serve two islands costs 40 percent less than two smaller ones. Plant cost was $1,300,000. It handled up to eight mgd. Raw sewage entering the plant is first commuted, then channeled into the aeration zone where it is completely mixed with recirculated sludge. The complete mixing speeds up sewage decomposition and allows the basin's storage area to be small.

67-0694

Federal Water Pollution Control Administration. The beet sugar industry—the water pollution problem and status of waste abatement and treatment. Report PR8. Denver, June 1967. 144 p.

A detailed study was made of the sugar beet mills and of the Johnstown, Colorado, (sugar recovery-Monosodium Glutamate) factory, located in the South Platte River Basin. Information was secured on process and operation, water supply, the beet flume system and waste flume water, beet pulp, lime mud wastes, the main plant sewer, and available waste abatement and treatment facilities. Total factory waste loads before and after treatment are discussed. Results were collected on the bacteriological aspects of sugar beet waste pollution from many studies conducted in the United States, and a comprehensive review and evaluation of waste abatement and treatment both in the United States and abroad is given. Overall waste reduction by means of available treatment at the mill sites was only 8 percent for BOD and 58 percent for total suspended solids, whereas total coliform bacteria loads demonstrated a 23 percent overall increase. The big picture of sugar beet waste disposal in the South Platte River Basin strongly implies that much remains to be done. A bibliography is appended.

67-0695

Filter pressing of undigested sludge: WPRL report. Surveyor and Municipal Engineer, 130(3930):74, Sept. 30, 1967.

There have been a number of reported failures of the heated digestion process and an increased area of drying bed required by the anaerobic digestion process, possibly the result of the detergent content. Therefore there is a need to take a second look at the filter pressing process as a means of dewatering sludge. Many of the difficulties experienced when filter pressing was first used in the nineteenth century have been overcome by better and more easily-operated presses and the use of more durable filter cloths. The synthetics have a longer life than the natural fibers previously used. The sludge, however, to make it more readily filterable, has to be conditioned with chemicals such as aluminum chlorohydrate, lime, ferrous sulfate, and ferric chloride. Heat treatment of the sludge in an autoclave at 180 C leads to a spectacular rate of filtration, although the filtrate can contain up to 20 percent of the original sludge solids driven into solution by the high temperatures used. Among the many variables which can affect the efficiency of sludge filtration is the amount of agitation which the sludge receives after it has been conditioned, since conditioning increases particle size and agitation reverses the process. The processes of sludge dewatering are now becoming the responsibility of the chemical engineer rather than the chemists or civil engineers who formerly coped with the problems.

67-0696

Filtration. Public Works, 98(1):138, 140, Jan. 1967.

The contents of a bi-monthly journal, titled 'Filtration and Separation' (Uplands Press, Ltd., Croydon) are discussed. Contents of the July-August 1966 issue are used as an example. The lead article is on the mechanical dewatering of sewage sludge in Britain. It describes the sewage sludge handling system at the Long Reach, Dartford Works of the West Kent Main Sewerage Board, which handled an average flow of 32 mgd from a population of just under 700,000. The second article is an extensive review of the book 'Solid-Liquid Separation: A Review and a Bibliography.' This book comprises 1,003 pages and a bibliography of 5,195 items, many of them abstracted. Other articles in the issue include 'Monitoring Aviation Turbine Fuel for Contamination,' 'Dust Separation and Control,' and a review of filtration research at University College. The last half of the journal is devoted to the proceedings of the Filtration Society including articles on 'Filtration of Biological Particles From Air,' 'Testing of Hydraulic Fluid Filters,' 'Particle Separation in Soils Engineering,' and a description of a visit made by officers of the Filtration Society to Holland. The publication also includes an intensive review of new equipment and materials in the field of filtration together with a list of new inventions and abstracts of specifications from UK patents.

67-0697

Fischer, A. Treatment and elimination of industrial sludges. Chemie-Ingenieur-Technik, 39(4):157-165, Feb. 1967.

Almost all sludges have a water content between 90 and 99.5 percent and contain colloidal substances which are difficult to separate. The dehydration of sludges is performed in several steps. In the thickening process, large quantities of water are separated from the solid parts. The 'capillary' water is removed by mechanical dehydration. Subsequently, the absorbed water is evaporated by drying at an increased temperature. Reduction of the volume of the sludge by water separation is illustrated in a diagram. There are various ways of dehydrating the sludge, such as filtering and centrifuging. In the filtering of sludges, flocculants (ferrous sulfate, ferric chloride) or ashes are added to make the process more effective. All additives are discussed in detail. The chamber filter is best suited for pressure filtering, while the rotating filter is used in the vacuum filtration. Centrifuges are discussed in detail. Composting of sludges, common incineration of sludge and solid waste, and wet oxidation are briefly reviewed. Sludge treatment by single-step and several-step methods is compared, including cost. (Text-German)

67-0698

Fischerstrom, N.H., E. Isgard, and I. Larsen. Settling of activated sludge in horizontal tanks. Journal of the Sanitary Engineering Division, Proceedings, American Society of Civil Engineers, 93(SA3):73-83, June 1967.

A study was conducted at twenty Swedish activated-sludge plants during the summer of 1964 on the evaluation and design of secondary sedimentation tanks. Secondary sedimentation is now conducted mainly along two lines: horizontal straight flow settling, or vertical settling. The first type tries to reduce the influence of density currents by 'hydraulic stability,' whereas the second type uses the density of the sludge to stabilize the flow. The study concerns only the first type of basins. It is concluded that the bulk settling velocity, W, is a function of the volumetric sludge concentration, V. The relation is approximately WV=K, in which K varied between 0.5 and 1.2, with an average of 0.85. This relation gives a theoretical rate of bulk sludge removal from a horizontal settling basin. The sludge index i, did not show any correlation to the variation of the number K in the above expression. The turbidity of the clear water decreased when the true detention time increased to about one hour. An increase of the settling time in excess of 1 hr had negligible influence. The investigation showed the importance of considering certain hydraulic factors in the design of secondary sedimentation tanks. Such factors are: the volumetric concentration of the mixed liquor, the appropriateness of presettling and flocculation, and the dimensioning and design of the tank to assure adequate true detention time and velocities below the resuspension velocity.

67-0699

Fuller, H. E. Sludge handling in a rectangular clarifier. Tappi, 50(10): 82A-84A, Oct. 1967.

In the consideration of possible clarifier designs for the effluents from the groundwood washers and the main fiber-bearing outfalls from most of the paper machines, it was desirable to use a rectangular storage basin. The successful use of the rectangular clarifier requires that the influent be fed to the clarifier in a steady, laminar manner with equal solids distribution in the transverse direction and that a method be devised for removing the sludge from the clarifier floor. The purpose of this investigation was to determine the feasibility of adapting the existing rectangular basin at a paper mill for use as a clarifier. The study includes a determination of the sludge settling patterns and the implementation of a piping grid withdrawal system. Following examination of the distribution of the settled sludge (shown in transverse and longitudinal plots), it was found that the use of a perforated headbox wall and baffles around the sides and end of the inlet flume minimized cross-clarifier surging and flattened the transverse sludge profile. Sketches are given of the piping grid layout showing the withdrawal pipes, the overall clarifier system, and the sludge probe using photocells to 'feel' the sludge-liquid interface. In spite of the problems associated with rectangular clarifiers, the existing basin could be used in the clarification system.

67-0700

Genetelli, E. J. DNA and nitrogen relationships in bulking activated sludge. Journal of the Water Pollution Control Federation, 39(Part 2)(10):R32-R43, Oct. 1967.

The purpose of this investigation was to determine if organic loading parameters based on nitrogen and deoxyribonucleic acid (DNA), as an estimation of active cell mass, were better indicators of process performance than the sludge loading ratio. Three laboratory activated sludge units were set up, with one given in diagram. Casein hydrolysate diluted with tap water was the substrate used and the sludge loading ratio was kept constant at 0.5 lb BOD per lb of mixed liquor and volatile suspended solids. Figures are given of various relationships between Sludge Volume Index (a measure of bulking or the efficiency of separation of sludge in a settling tank), DNA, and nitrogen. Tables are given of the average results from replicate runs, the typical nucleic acid constant of several bacterial species, and a summary of experimental conditions for the glucose run. The following results were reported: a loading parameter for activated sludge may be based on lb of BOD fed per day per lb DNA in aeration basin; a parameter based on DNA was more sensitive than the conventional loading parameter based on volatile suspended solids as an index of organism concentration; a parameter based on nitrogen was adequate when the substrate fed was glucose and was not applicable when casein hydrolysate was used as a feed; the DNA content of activated sludge was a function of both quantity and type of organism present; and a shift in the population of activated sludge to what appeared to be a predominantly Sphaerolilus mass was found to occur prior to a rise in the SVI. It was concluded that the DNA content of an activated sludge has potential as an excellent process control parameter and that the results found in this study are applicable to actual waste water treatment facilities.

67-0701

Gilde, L. C. Experiences of cannery and poultry waste treatment operations. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.675-685.

The various waste treatment facilities of a nationwide soup canning company are described. The Paris, Texas, division has pretreatment of grease recovery, and 10-mesh screening prior to being pumped to the spray irrigation field. The spray system is laid out on land that is contoured so that the wastes flow in a thin sheet across the surface of the land and are collected in terraces to be conducted off the field. Grasses were planted to produce a protected habitat for soil microorganisms and a vast area for the absorption of organic impurities. In Sumpter, South Carolina, which has a poultry processing operation, an entire field was underdrained at 200-ft spacing and a perforated pipe wrapped in fiberglass matting was conducted to a natural lagoon. At the Napoleon, Ohio plant, waste is treated in a two-stage trickling filter operation with intermediate aeration between the filters and settling stages. During the tomato season, there is an additional 6.5 MGD which is treated by a spray irrigation system similar to the Paris operation. One poultry lagoon is located in Canada and one in Tecumseh, Nebraska. The Tecumseh lagoon system was initially designed on the basis of three aerobic ponds, each approximately 15 acres, having a loading of 50 lb BOD per acre per day. Because of odor problems due to increased loadings, an anaerobic cell was installed immediately ahead of the aerobic lagoons. Another chicken processing plant in Maryland operated the year around on a system of spray irrigation and bubbling orifice.

67-0702

Golueke, C. G., and P. H. McGauhey. Anaerobic digestion with sewage sludge. In Comprehensive studies of solid wastes management; first annual report. Sanitary Engineering Research Laboratory Report No. 67-7. Berkeley, University of California, May 1967. p.118-141.

Investigators built several laboratory digestors to parallel the operation of the anaerobic digestors at a municipal sewage plant. The effects of shock loading green garbage in various proportions was studied. The rationale for this study is primarily the growing use of home garbage grinders. Future use of grinding stations, placed so that organic wastes can be disposed directly into the sewage lines, is envisioned. The product from digestion is a relatively acceptable landfill material. Results of the program indicate that garbage levels up to 75 percent can be tolerated by digestion units although the higher percentages show an initial shock response. Higher percentages than 75 percent produce enough acid to kill the organisms in the culture. The effects of various ratios of garbage to sewage are graphically represented as far as volatile acid production, gas production, digester efficiency, methane concentration, carbon dioxide concentration, alkalinity, and pH are concerned. Diagrams and photographs show the apparatus used for this research.

67-0703

Golueke, C. G., and P. H. McGauhey. Wet oxidation of organic wastes. In Comprehensive studies of solid wastes management; first annual report. Sanitary Engineering Research Laboratory Report No. 67-7. Berkeley, University of California, May 1967. p.142-160.

Research into the wet oxidation of solid organic wastes is currently awaiting the completion of laboratory apparatus to test the parameters and economics of the process. A thorough literature study has been done, however, and it demonstrates the probable success of the program. Many sulfite paper mills have been using this method and several cities are using the process for sewage sludge oxidation. The process involves the combination of molecular oxygen or atmospheric oxygen with organic material in an aqueous suspension or solution under superatmospheric pressures and at elevated temperatures. The resultant energy may be recovered as electricity or steam. Low molecular weight acids which are difficult to oxidize result from the process and may be separated and sold. Diagrams are included showing a previously developed wet oxidation process and the proposed laboratory system which is being built. Tables list performance of sludge oxidation studies, chemical characteristics of sludge oxidation plants, operating costs of sludge oxidation plants, and potential values of organic acids that could be produced from spent pulping liquors.

67-0704

Grimes, L. M., and R. W. Kueneman. Primary treatment of potato processing wastes with byproduct feed recovery. Journal of the Water Pollution Control Federation, 41(7):1358-1367, July 1967.

The rapid growth of the potato processing industry has created a serious pollution problem because an average sized processing plant producing French fries or dehydrated potatoes creates a waste load equivalent to a city of over 200,000 population. When the Idaho State Health Department asked the potato processors to provide primary treatment and remove at least 50 percent of the BOD, it was realized that very little has been done to determine the nature and treatability of potato waste, and that it would be impossible to proceed immediately with the design of treatment plants. Each of the standard methods and steps of primary treatment was investigated. When sedimentation test work revealed a very promising reduction in suspended solids, it introduced at the same time, a new problem: what to do with the large volume of settled solids. Results showed that straight potato filter cake at high pH levels could not be fed to cattle. However, if the cake was stored until the pH dropped to neutral or below through fermentation, and the sludge was combined with other feeds, the sodium content did no harm.

67-0705

Gupta, S. C., J. P. Shukla, and K. A. Prabhu. Utilization of biogas in sugar industry. Indian Sugar, 17(9):675-676, Dec. 1967.

The biogas-biomanure process, developed at the National Sugar Institute in collaboration with Hungarian experts, is described. In this process, bagasse, cane trash, press mud, boiler ash, and cane yard sweepings can be actively fermented under controlled conditions resulting rapidly in a combustible gaseous mixture of 65 percent methane and 35 percent carbon dioxide called biogas. In addition, a manure is formed which is rich in nutrients and humus, and which has received favorable response compared to fertilizer or farm yard manure. The advantages of this process are: the two major wastes, cane trash and bagasse, along with other sugar factory wastes, are properly utilized; their fuel value does not get lost and alternate fuel is avoided by burning of biogas, with an efficiency of over 85 percent; and the return of biomanure to cane areas results in increased yield and better economy. Since the presence of carbon dioxide lowers the calorific value of biogas, attempts have been made to utilize the carbon dioxide in the preparation of precipitated chalk for paper factories and for cane juice clarification. These processes are described and the tabulated results show that the carbon dioxide in the biogas can be successfully used in these processes.

67-0706

Haltrich, W. Elimination of nitrate from an industrial waste. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.203-210.

A synthetic waste water composed of effluents from 20 plants in the Badische Anilin- & Soda-Fabrik was used to study the biological purification of an organic industrial waste containing large amounts of nitrate. The experiments were carried out in a continuous-flow pilot plant constructed of transparent plastic. Batch tests and continuous-flow pilot studies both indicated that organic industrial waste containing nitrate can be purified by the activated sludge process without disturbances in the sedimentation tank. This is achieved by denitrification, i.e., mixing the nitrate-containing waste with the activated sludge in an unaerated stage to split the nitrate. The rate and effectiveness of nitrate depletion are dependent on the supply of hydrogen donors measured as five-day BOD. In the presence of BOD, up to 60 mg of nitrate oxygen was removed per gram of MLVSS per hr. Provided adequate BOD is available, the removal of nitrate is dependent upon the nitrate oxygen sludge load. A process employing an unaerated denitrification state preceding the aerated state not only effects an appreciably higher rate of nitrate elimination in the raw waste but also ensures troublefree operation during sedimentation, because the nitrogen gas formed in the activated sludge is blown out.

67-0707

Hanway, J.E. Fluidized-bed processes—a solution for industrial waste problems. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.183-193.

The application of the Copeland Process to the treatment of waste effluents from the paper and pulp industry and other industries, to eliminate stream pollution, is described. The fluidized-bed system for treatment of neutral-sulfate, magnesia-base sulfite, and kraft or sulfate pulping operations is illustrated. Applications of the process in the steel, chemical, petroleum, and food industries are reviewed. The application of the Copeland Process to the treatment of sewage sludge, by which the offensive and objectionable nature of the sludge is permanently destroyed, is outlined. The only product is a small volume of inert material originally contained in the sludge. In general, any waste product containing a combustible constituent represents a promising candidate for the fluidized-bed process. A typical analysis of exhaust gases from fluidized-bed treatment of pulping waste is given.

67-0708

Harmsen, H. The purification plant of the company E. Merck AG in Darmstadt. Staedtehygiene, 18(5):110-113, May 1967.

The purification of polluted water is discussed. In connection with the purification plant a sludge incinerator is operated. Daily about 1,000 cu m of sludge with a water content of 99 percent are delivered to the incinerator plant. First the water content is reduced in a separator. To the sludge which now contains 3 percent of solids, iron sulfate is added as well as lime and ash to permit better filtration. A conveyor belt carries the sludge from the filter to the furnace. In the upper 5 shelves of the furnace the sludge is dried and in the oil-heated flame chambers it is burned at temperatures above 800 C. The ash discharged from the furnace goes to a storage room. (Text-German)

67-0709

Harmsen, H. The sewer sludge problem. Staedtehygiene, 18(11):262, Nov. 1967.

In almost all sewage treatment plants, the elimination of the accumulating sludge is still an unsolved problem. The drying of sludges at high temperatures to sterilize them, and the incineration of toxic industrial sludges, require a considerable amount of additional heat. Sewer sludges, preponderantly from domestic waste waters, contain substances valuable to the formation of humus, even after the rotting process. The improvement of soil fertility cannot solely be achieved with artificial fertilizer; it would be advisable to utilize the sludges from sewage treatment plants for soil improvement. Composting the sludge can turn it into a highly useful product. The Netherlands is an outstanding example in this respect. Through a combined effort of its metropolitan areas, in the field of waste and sludge elimination, they succeeded in cultivating desolate areas. In East Berlin a similar effort is made to recultivate the exhausted and denaturalized soil. In West Germany such projects have failed so far because of an over-emphasis on states' rights which has made successful interstate cooperation impossible. (Text-German)

67-0710

Harza Engineering Company. Land reclamation project. The Metropolitan Sanitary District of Greater Chicago, Oct. 1967.

Sites, routes, and modes of conveyance selection studies for the utilization of digested sludge for land reclamation are summarized. The investigation, performed for the Sanitary District of Greater Chicago, by Harza Engineering Company, was in part supported by a grant from the Public Health Service, U.S. Department of Health, Education, and Welfare. A staged program of land reclamation by use of digested sludge is recommended. This program is designed to accommodate the gradual increase in sludge production and the phasing out of present methods of sludge disposal. The recommended four phase program includes the following: initiation of a sludge utilization experimental program; acquisition of a 1,700 acre sludge utilization site; development through the period 1968 to 1971 of cooperative sites; and acquisition of a 21,500 acre site at Essex designed to utilize beneficially the forecasted sludge production of the Sanitary District in the year 2015. Some of the areas investigated are: agriculture economics, environmental considerations, sludge properties, soil considerations, agriculture development, socio-economic characteristics, and cost and benefits. Thirty-nine appendices include: site maps, sludge loading illustrations, site plant, population tables, and conveyance routes.

67-0711

Higgins, G. C. Industrial waste treatment at Trans World Airlines overhaul base. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.194-202.

There are four distinct waste streams requiring treatment at the Trans World Airlines overhaul complex, located at Mid-Continent International Airport: alkaline-cyanide, acid-chrome, industrial-petroleum, and sanitary. The cyanide bearing waste is destroyed by the alkaline-chlorination process which oxidizes the cyanide to carbon dioxide and nitrogen. The chrome bearing waste is destroyed by reducing the hexavalent chrome to the trivalent state and precipitating it as the insoluble hydroxide. Combining the two wastes before they pass into the settling basin produces a neutralized effluent. The sludge will be removed through a time controlled blow off valve to the new sludge storage vault. Wastes are chemically monitored through the treatment process. The existing pertroleum waste treatment plant is designed to remove oil through gravity separation and chemical treatment. The secondary treatment facilities being installed are a trickling filter and secondary clarifier. The tertiary treatment portion of the plant will consist of two lagoons with a total surface area of eight-tenths acre. A new cloth media vacuum filter and building to house it are under construction. In the past, sludge was dried for one year before being removed. In the future, less than a three-month drying period will be available. A sludge thickening basin is included as an integral part of the filter building that is capable of storing two to three days' sludge volume.

67-0712

Hinkle, J. E., and R. A. McCoy. Sewerage program wins by 10-1 vote. American City, 82(7):74-75, July 1967.

A single sewage treatment plant, incorporating the extended aeration process of sewage purification, replaced two obsolete ones in Monroe, North Carolina. The process was selected on the basis of its high efficiency and relatively low initial cost, despite its somewhat high operating costs. Construction costs for three new outfall sewers came to $781,994 and the contract price of the plant designed for an average flow of 3.0 mgd and a peak flow of 3.9 mgd came to $653,222. The aeration facility consists of four concrete tanks, each 60 ft wide by 120 ft long with a 14-ft water depth and equipped with two Eimco Simcar aerators. Driven by 30 hp motors, these mechanical surface aerators have a design capability of delivering 2,225 lb of atmospheric oxygen per day per unit. The tanks were sized to treat 8,850 lb of BOD per day (354 ppm at 3.0 mgd.), with 2 lb of oxygen required to satisfy 1 lb of BOD. They were geometrically designed and the aerators spaced and selected to provide solids suspension and complete mixing. A time clock on each unit permits intermittent and sequential operation. A flow diagram, which details the operation of the plant, is provided. While the plant was designed on the basis of an influent BOD of 354 ppm with an expected removal of 92 percent, in practice the influent BOD has averaged only 173 ppm and removal has averaged 94 percent.

67-0713

Imhoff, K. R. English per capita values of suspended particles and the BOD. Wasser und Abwasser, 108(36):1021, Sept. 1967.

The Research Institute in Stevenage and the Institute of Water Pollution Control in England published (J. Water Pollution Control 2:193-196 (1967)) 4 tables listing values for the BOD, suspended particles, potassium permanganate demand, ammonia nitrogen, and organic nitrogen. The average results of numerous tests are given. Especially interesting values for the BOD and the suspended particles were converted into German units and listed in a table. The mean values for the BOD, 35 g per capita per day total, 34 g per capita per day settled, correspond to the values 54 g and 35 g of the Taschenbuch der Stadtentwaesserung (21st edition p.86). The figures for suspended particles are 57 g per capita per day (total) and 22 g per capita per day (Taschenbuch: 90 g and 30 g). (Text-German)

67-0714

Investigations into harvested cane deterioration at Tully. Australian Sugar Journal, 59(7):393-394, Oct. 1967.

A series of investigations are being carried out at Tully to obtain more information about the deterioration of cane harvested by chopper compared with wholestalk in order that mechanical harvesting can be placed on the soundest possible foundation. The study involves simultaneous harvesting by chopper and wholestalk machines in the same block of cane. Each harvest consists of 18 bins of chopper cane and 18 trucks of wholestalk. Mixing is arranged on the farm so that the bins are delivered to the mill as three rakes of six, each rake containing similar cane. The same is done for the wholestalk trucks. The rakes are weighed on arrival and one is crushed on arrival. Fifteen hours from cutting the remaining rakes are reweighed and the second rake is crushed and sampled. The next weighing, crushing, and sampling is done at 25 hr from cutting. The harvesting takes place twice a week for a minimum of 10 weeks, allowing a large number of rakes to be tested and sampled. The objective is to obtain an indication of the comparative weight loss and c.c.s. changes between chopped and wholestalk cane from the cooler dry weather to the hot humid part of the season. Various sugar organizations are cooperating in the trials which consist of the varieties Q57, Q66, Q78, Q83 and Pindar.

67-0715

It took four years, but now one industry stops polluting. Civic Administration, 19(12):19, Dec. 1967.

A Chatham, Ontario, industry began a staged pollution control program by first re-using process water. Then problem wastes were segregated for separate treatment. The process has been modified so that less waste will be produced. The company reduced the strength of its wastes by 94 percent.

67-0716

Jacobson, A. R. Steel plant wastes. Public Works, 98(2):130, Feb. 1967.

Wastes from the hot mill of the Burns Harbor Plant of Bethlehem Steel are treated in a scale pit to remove particulate matter and oil, then in flocculate-clarifiers and a lagoon. Cold-mill wastes pass through oil separators, scalping tanks, flocculator-clarifiers, and the lagoon. Lagoon discharge flows down a turbulence-producing ditch to the receiving stream. Waste pickle liquor is neutralized. Certain sludges are separated for resale, and recirculation of water is practiced.

67-0717

Jaeschke, L., and K. Trobisch. Treat HPI wastes biologically. Hydrocarbon Processing, 46(7):111-115, July 1967.

A description is given of the development of a biological purification method for waste waters of petrochemical, plastics, and solvent production operation of the Hoechst plant of the Farbweke Hoechst AG on the lower Main River at Frankfurt, Germany. The waste streams came from the following operations: methane chlorination, pyrolysis of hydrocarbons, thermoplastics, resins and dispersions, and solvents. Other production unit effluents contain benzene, toluene, other hydrocarbons, alcohols, esters, aldehydes, and organic acids. Testing over a period of several months showed that for total of 1,000 cu m per hr of waste water, the following must be purified biologically: BOD 1,250 g per cu m; COD 2,690 g per cu m; potassium permanganate consumption 600 g per cu m; carbon-content 20 g per cu m, salt content 600 g per cu m and pH 2 to 7.5. A biological treatment pilot plant for waste treatment which included facilities for mechanical and chemical treatment (a schematic sketch of which is given along with a processing diagram of the projected large scale installation) was constructed. The waste water was activated with activated sludge and then passed to a settling tank to reduce the BOD to less than 50 g per cu m. Chemical treatment before or after the biological treatment had no advantages. The nitrogen and phosphorus compositions necessary for biodegradation which are added contain 3.5 percent soluble phosphorus and 20 percent soluble nitrogen. For each cubic meter of waste, 0.15 kg of this nutrient are needed. Charts are given to show: BOD decomposition for raw water and effluent, in the rectangular tank and aerator; and the BOD decomposition rate as a function of the space loading and solid loadings for detention times of 7.5 and 9 hr (with the performance range of the large scale plant superimposed). The design data for the large scale installation required to reduce the BOD from 1,250 g per cu m to less than 50 g per cu m are given along with a diagram of the new plant which is expected to contribute to an improvement of the lower Main River.

67-0718

Japanese Ministry of Health and Welfare. A brief report on public health administration in Japan (Jan. 1965-Aug. 1966). Asian Medical Journal, 10(9):650-653, Sept. 1967.

A discussion of sanitation facilities, in a section of the report on environmental sanitation, includes sewage treatment, nightsoil disposal, and garbage and trash disposal in Japan. By the end of March, 1965, 77 cities were operating sewage treatment plants which served a population of 11,060,000, and 120 cities had sewage plants under construction. Proper nightsoil disposal still remains one of the important environmental sanitation problems. During 1964, 325 communities were operating nightsoil disposal plants with additional ones under construction in 345 communities. A connection between nightsoil disposal plants and sewage systems is planned for the future. It is also planned that 25,000,000 persons will be serviced by a flush-toilet system by March 1968. Incineration, the most widely used method of garbage and trash disposal, and composting, benefited 48,640,000 persons by the end of March 1966.

67-0719

Jarnuszkiewicz, I. The effect of nitrogen deficiency on glucose oxidation by activated sludge. Biuletyn Instytutu Medycyny Morskiej Gdansku, 18(3/4):193-201, 1967.

The effect of short- and long-term nitrogen deficiency on the biological oxidation of glucose by activated sludge was evaluated. Two activated sludge cultures, A and B, carried on by the Malaney's method, were adapted to glucose: A- in the presence of ammonium salts; B- without the nitrogen source. The glucose oxidation in the A-sludge and B-sludge was investigated by the anthrone method. The results, which are presented in a series of graphs and tables, give the biochemical characteristics of sludge cultures, the rate of substrate elimination, exertion of theoretical oxygen demand, the increase in suspended solids mass and the carbohydrates, nitrogen, and amino acid content of the cell mass. It was concluded that activated sludge adapted to glucose under nitrogen deficiency conditions shows a lowered activity. Substrate removal occurs mainly through carbohydrate storage and only partly through assimilation. Energy requirements of the system with the sludge adapted without exogenous nitrogen source are greater in growth than in respiratory conditions. The carbohydrate/nitrogen ratio in the activated sludge may be used as the index in the control of nitrogen-free carbohydrate sewage treatment by the activated aeration method.

67-0720

Jarnuszkiewicz, I. Influence of adaptation in glucose oxidation by activated sludge. Biuletyn Instytutu Medycyny Morskiej Gdansku, 18(3/4):183-191, 1967.

The influence of activated sludge adaptation on the main parameters of the glucose oxidation process and on the level of carbohydrates, nitrogen, and amino acids in sludge cells was investigated. The sludge was aerated for 48 hr without feeding, before its use in respirometric experiments for complete utilization of the intracellular storage products. The glucose oxidation in both the respiring and the growth systems with unadapted and adapted sludge was investigated, as were the carbohydrate and amino acid content, and the amount of suspended solids. The results, which are presented in a series of graphs, show that: (1) The rate of substrate removal in systems with adapted sludge was almost 5 times as high as in systems with unadapted sludge. (2) In systems with adapted sludge the exertion of theoretical oxygen demand was lower. (3) The increase of suspended solids in both systems with adapted sludge was higher by 25 percent than in unadapted sludge. (4) Carbohydrates in adapted sludge amounted to 88 percent, in unadapted sludge to only 65 percent. (5) The ratio of amino acid nitrogen to organic nitrogen was 9 times higher in the growth system with adapted sludge than with unadapted sludge. (6) The level of amino acids in adapted sludge was many times higher. It was concluded that the glucose-adapted activated sludge shows intensified biological activity in the glucose oxidation. In the first phase of the oxidation, the substrate removal in the system with adapted sludge takes place mainly due to carbohydrate storage. The ability of the system with adapted sludge to store carbohydrate is related to the high level of amino acids in the sludge cells.

67-0721

Kato, K., and Y. Sekikawa. Fixed activated sludge process for industrial waste treatment. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.926-949.

A series of experimental studies was carried out at the Kurita Central Laboratories, Japan, for improving the common activated sludge process. The new process is known as the 'Fixed Activated Sludge Process' or the FAS process. The constant concentration of sludge in the aeration tank is accomplished by fixing the suspended flocs of activated sludge on the surface of plastic net panels which are arranged vertically into the tank. Since most of the activated sludge adheres to the net panels, it is not necessary to return the sludge from the final settling tank. The plastic net panel used as the sludge-fixing body is cheap. In the case of domestic sewage treatment, biological growth began to adhere to the net panels after 7 to 10 days, becoming steady after successive aeration for 3 weeks. A BOD removal rate of 85 to 90 percent could be obtained at a loading of 75 to 80 g-BOD per sq m of surface area of net panel per day. Estimation of growth rate of activated sludge in the FAS process shows that about 20 to 30 percent of BOD removed from the influent has changed to biological solids. In the treatment of industrial waste, petrochemical and soft drink bottling waste, a two stage treatment, consisting of the FAS process followed by the activated sludge process, has proved to be best from the viewpoint of simple operation in practice, steady performance against shock loading, and the high rate of BOD removal. The FAS process shows an improvement over the activated sludge process for solving the problem of sludge bulking.

67-0722

Keim, O. Water protection in the Federal Republic of Germany. Wasser und Abwasser, 108(12):305-309, Mar. 23, 1967.

The first international fair for waste water technology took place in 1966 in Munich. On huge boards impressive statistics, illustrations, models, and explanatory texts informed the visitor about the manifold tasks confronting the Federal Government in the field of water protection. The tremendous government programs designed to cope with the various problems were pointed out. Several posters demonstrated the sanitary deposition of waste so that the groundwater is not spoiled. Various exhibits are described in detail. Maps showing water protection projects are reproduced. (Text-German)

67-0723

Kennedy, T.J., G.A. Ettelt, and A.J. Kaplovsky. Effect of centrate from solid bowl centrifuge on activated sludge process. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.145-164.

The solid-bowl centrifuge has received more interest in the water pollution control field compared to the disc or nozzle type because of clogging problems with the latter. In a 147-day test with a disc type centrifuge, operating at an average solids recovery of 76.3 percent, a higher sludge volume index in the aeration tanks receiving the centrate as compared to the other aeration tanks was reported. Data of batch aeration tests using centrate produced by a solid bowl centrifuge are presented. A pilot activated sludge system was selected which simulated spiral flow. A summary of the operating and performance data is given. It was concluded that the centrate solids from the solid bowl centrifuge are mainly generated fines consisting of dissoluted zoogleal masses and fragments of filamentous forms. Primary treatment could remove the bulk of centrate solids from centrifugation installations operating at solids recoveries of at least 70 percent. Continuous return of centrate solids to a conventional activated sludge process, after centrifugation of total waste solids output at solids recovery of 80 percent, should not affect the plant effluent quality or unit reductions of the activated process. However, an incremental rise in SVI could result, but the condition will not progressively deteriorate. Centrifugation may increase the content of filamentous forms in the activated sludge process when they are initially present at high levels.

67-0724

Lamb, J. C. Alum sludge disposal. Public Works, 98(9):150, 152, Sept. 1967.

Investigations were conducted for the New York State Department of Health to evaluate characteristics of waste flows from two water treatment plants which utilize alum as a chemical coagulant in upflow clarification units. Laboratory studies were conducted to determine the utility of sludge drying beds, vacuum filters, centrifuges, and lagoons for concentrating the sludges prior to disposal by landfill. At the 32-mgd Shoremont plant in Rochester, which also adds carbon and a clay coagulant aid, and the 1.0-mgd plant in Wolcott, the data were collected intermittently during a three-month sampling period. Filter backwash was grab-sampled at 30 second intervals. Data are presented for total solids and net solids removed from filters. Clarifier sludge in the two plants averaged 1,230 and 2,660 gal per million gal of raw water respectively. The total solids content of the sludges ranged from 1,500 to 10,000 mg per liter. Suspended solids content averaged 84 percent of the total solids and volatile solids ranged from 25 to 40 percent. The BOD of the sludge ranged from 36-77 mg per liter and the COD from 500 to 1,000 mg per liter. The settling and compaction characteristics of the backwash flows and sludges are also discussed. Centrifuges and lagooning did not meet the criterion of providing at least 20 percent total solids for disposal by landfill. The results of laboratory studies of vacuum filtration and of the more economical sand drying are detailed.

67-0725

Large waste water cleaning plant. Staedtehygiene, 18(9):219-220, Sept. 1967.

The plant in Hoechst of the Farbwerke Hoechst AG is building a large cleaning plant for industrial waste water. Total capacity of the pools is 30,000 cu m. Daily, the plant will process 24,000 cu m waste water by bacteriological decomposition. Additionally 3.5 tons of phosphorous and nitrogen compounds are fed to the microflora. The sludge, about 100-120 cu m daily, is dried on four rotating vacuum filters of 40 sq m surface each and will eventually be incinerated. The plant which cost 20 million DM is Europe's largest and the world's second largest industrial waste water treating facility. (Text-German)

67-0726

Lawson, H. M., and R. J. Fearn. Trade effluent charges. Institution of Municipal Engineers Journal, 94(2):60-64, Feb. 1967.

The Public Health Act of 1961, which clarified the nebulous provisions of the

Public Health Act of 1937, gave local authorities the power to charge for trade wastes being discharged into public sewers including those with prescriptive rights. Since all industrialists had to pay, the charges could now cover the actual cost of the service and not discriminate between new or expanding industries and those which were static. The cost of the special service that Nottingham is required to give for the reception, conveyance, and treatment of trade wastes is no longer a charge against the general rate fund, but is fairly distributed between the companies using the service and resulted in a revenue of Ŀ85,348 to Nottingham in the year 1964/65, which included Ŀ19,845 for reception and conveyance and Ŀ65,503 for treatment. Only the chemical oxygen demand and the suspended solids were measured on the effluents. Composite samples were prepared from automatic samplers. The effluent flow was based on the public supply records plus water obtained from wells and streams minus the water used in steam raising and that for domestic use. The schedule which was finally produced had the following charges: for reception and conveyance 2.44 pence per 1,000 gal; for biological treatment 1.4 pence per pound of oxygen demand; for sludge disposal 0.37 pence per pound of suspended solids. Following a hearing, all of the charges were approved over the objections of the users except that a charge of 0.78 pence was substituted for the oxygen demand charge.

67-0727

Link, P. The elimination of inorganic industrial sludges. Wasser und Abwasser, 108(36):1022-25, Sept. 1967.

Investigations of various sludge eliminating methods such as the deposition of unprocessed sludges, incineration, consolidation by adding cement and calcium sulfate, as well as a thermal treatment with subsequent consolidation, were conducted. The suitability of sludge for deposition was tested through a Soxhlet extraction which is explained briefly. The results showed that sludges cannot be deposited without prior preparation. The incineration of sludge was performed at temperatures of up to 1,000 C. The chromium III hydroxide is chemically split at temperatures of several hundred degrees to chromium VI if no reducing agent is present. Cyanides are more or less easily destructible below 1,000 C, depending on the composition of the sludge, so that incineration of inorganic sludges is not recommended. A petrification of these types of sludges, by adding cement or calcium sulfate, is too expensive and not very efficient because it increases the volume. The thermal treatment in a cement furnace seems to be a suitable method, if the cement industry is willing to cooperate. The simplest method, however, seems to be the establishment of regional industrial sludge disposal sites which are ‘safe’ as far as the groundwater is concerned. The deposition of sludges which react chemically to each other should be avoided. The sludges should be covered with rubbish, sand, or soil, etc., immediately after deposition.
(Text-German)

67-0728

MacDonald, F. W., and I. Lew. Environmental planning for a sewage treatment plant. Public Works, 98(9):105-106, Sept. 1967.

The architectural concepts employed in the design of a treatment plant are explored. In this design, an activated sludge treatment plant is arranged so that it need not be hidden from public view. The units of the treatment plant are not in themselves grotesque; it is the conventional manner of arranging them that has established an image of undesirability in the eyes of the public. Thus, a triangular control tower is surrounded by aerators and digesters, and the whole unit is surrounded by the circular sludge drying beds. The units are so arranged that gravity flow from the higher to the lower levels is utilized.

67-0729

Manual of septic-tank practice. Public Health Service, Publication No. 526. Cincinnati, U.S. Department of Health, Education, and Welfare, 1967. 92 p.

The manual is a revision of Public Health Service Publication No. 526, Manual of Septic Tank Practice, with addenda on Serial Distribution Systems’ and ‘Seepage Beds’. The updating reflects changing trends in the problems of individual sewage disposal systems and includes new information in this field. Connection to an adequate public sewage system is emphasized as the most satisfactory method of disposing sewage. Every effort should be made to secure public-sewer extensions. Where connection to a public sewer is not feasible, the manual is offered as a guide to those seeking to construct individual sewage-disposal systems. Septic tank-soil absorption systems for private residences, institutions, recreational areas, and other establishments are discussed. Percolation tests, soil absorption systems, selection of septic tanks, specifications for septic tanks, estimates of sewage quantities, collection systems, grease traps, capacities, subsurface and superficial sand filters, chlorination, and general maintenance of septic tanks are discussed. Numerous illustrations on equipment, layout, percolation tests, and design formulas are presented.

67-0730

Matthews, W. C., G. H. Andrews, and J. K. Sullins. Centrifuges for paper mill waste sludge dewatering. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.325-333.

The solid-bowl horizontal-conveyor type centrifuge is described. Paper making operations at two divisions of a pulp and paper corporation, one located at Chillicothe, Ohio, and one at Kingsport, Tennessee, are briefly reviewed. Kingsport chose a lower speed intermediate 'G' force centrifuge while Chillicothe, where the ultimate disposal system favored aerated lagoons and high solids removal was desirable, decided to use the higher speed machine with the larger 'G' force. The effluent treatment plant at Kingsport is based on the use of a 150-ft circular clarifier designed to handle a hydraulic loading of 14 MGD. Sludge is discharged at concentrations of up to 45 percent solids, and drops to a conveyor belt that discharges to trucks. Recovery of solids in the centrifuge ranges from 80 to 90 percent. The primary waste treatment facilities at Chillicothe consist of a rectangular flocculator-clarifier with centrifuge sludge dewatering equipment. Sludge is pumped to the centrifuges, dewatered to approximately 40 percent solids and hauled by truck to a landfill. The recovery of solids is approaching 90 percent of the feed.

67-0731

Mechanical sludge lifting at Denton. Water and Waste Treatment Journal, 11(5):242, Jan.-Feb. 1967.

The sludge lifting equipment for the 15,100 sq yd of sludge drying beds at Denton U.D.C., England, is described. The beds contain two rows 58 ft wide and two rows 62 ft wide. Sludge lifting is effected by a Wickham Super Lynx Mechanical Sludge Lifter with a span of 62 ft 7½ in. One man can clean over 1,000 sq ft of sludge an hour. The machine will resand, level the beds, rake the surface of the filter, and rake the thin cake sludge. Sludge is discharged from a conveyor belt to trucks for transport to a covered drying area where it is shredded, bagged, and sold as a substitute for fertilizer or manure.

67-0732

Mechanical treatment of refinery wastes. Petroleum, 30(3):112-113, May-June 1967.

Mechanical separation processes for refinery waste are discussed for possible application in the United Kingdom. Liquid waste collected from various points in a refinery is traced through the sewerage system to the treatment plant where preliminary separation removes a percentage of the water. A vibratory screen is suggested to remove froths of high oil content resulting from the first steps of treatment. This Sharples Vibroscreen and the Sharples Nozljector are described in detail. Treatment of wastes with high solids content is also explained suggesting preliminary separation through a vibrating screen, slight reduction in a cyclone, and final separation in a centrifuge. The economics of the system are briefly mentioned, including the possibility of using an opening-bowl centrifuge instead of the Nozljector. These three arguments are presented against that possibility: the tendency for oil loaded sludge to cake; the solids, having abrasive qualities which an open bowl machine is incapable of handling; and the lack of uniformity in the composition of the slop oils which is incompatible for this aim.

67-0733

Meigh, D. F. Use of silicon rubber to prepare mixtures of organic vapors and air of known composition. Chemistry and Industry, (35):1487-1488, Sept. 2, 1967.

Silicon rubber, as a diffusing membrane, is used in a scrubber for removal of carbon dioxide from the atmosphere surrounding stored fruit. Organic liquids are diffused through the rubber at a constant rate—proportional to the surface area and inversely proportional to membrane thickness. For experimentation, silicon rubber tubing was made into a container for the liquid and mounted in a glass tube. The container was weighed at intervals to determine liquid loss. The length of the tube was adjusted to obtain the desired concentration of vapor in the air stream. Carboxylic acids, thiols, and ketones caused the rubber to swell. For calibration of a gas chromatograph, Meigh and Currah aerated a solution in silicon oil. Rate of diffusion of nonyl alcohol through a five mm o.d. tube of one mm wall thickness was 0.62 mg per hr per sq cm surface at 20 deg, 0.38 mg per hr per sq cm and 0.09 mg per hr per sq cm at 1 deg.

67-0734

Mencher, S. K. Minimizing waste in the petrochemical industry. Chemical Engineering Progress, 63(10):80-88, Oct. 1967.

The hydrocarbon processing industry has problems in waste management because of the great variety of its products and the many processes used. The application of the concepts of waste management to process design and plant operation are the objectives of this review. The best approach to the pollution problem is by control at the source. The petrochemical industry lends itself to this control through process improvement rather than pollution abatement. Although the chief problems covered in this review concern air and water pollution, some mention is made of solid waste disposal. A diagram is given of the terminal waste facility for a refinery petrochemical complex. This diagram shows several sources of sludge such as from the API separator which receives the discharge from the oily water sewer, the chemical flocculator which treats the liquid from the API separator, and also from the biological unit which, in return, receives liquid from the chemical flocculator and from the septic tank used for the sanitary sewer. Reagents such as aluminum sulfate, ferric chloride, or aluminum chloride are used to produce voluminous precipitates in the flocculator to reduce the oil content. All of the sludges have their moisture content reduced in a thickener before filtration. The cake from the filter is then incinerated leaving the ash as the sole solid waste for disposal.

67-0735

Mill waste incineration. Chemical 26, 3(4):22-23, Apr. 1967.

Incineration is discussed as an effective way to dispose of dry wood flour and dewatered solids from mill effluent. The exact process used by Abitibi Corporation is explained beginning with dewatering in a solid bowl centrifuge and a clarifier-flocculator. The cake from the centrifuge is blended with fine sawdust and burned. A diagram of the waste flow is included.

67-0736

Moehle, F. W. Fly ash as a filtering aid for dewatering industrial waste plant sludge. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.429-440.

Dewatering industrial waste plant sludge using fly ash as a filtering aid has proven successful at a rubber plant located in Mishawaka, Indiana. The chemical filtration plant is briefly described. The six major pieces of equipment involved in the dewatering process are: filter drum, sludge feed mixing conveyor, centrifugal blower, filtrate pump, blower type air compressor, and cake collecting chute. Fly ash is introduced approximately 10 in. downstream from the point at which the sludge enters the top of the sludge feed mixing conveyor. Trials and tests were undertaken to determine several variables of the dewatering process: proper concentrations of fly ash, effect of sludge temperature on the dewatering process, effect of hydrogen ion concentration of the sludge, effect of sludge solids concentration, and effect of various vacuum conditions. It was found that the fly ash concentration should be held at approximately four parts sludge to one part fly ash but must be adjusted depending on sludge solids concentration and may vary as much as from 1:2.5 to 1:6.7. The sludge temperature is held at 150 F. The operator must make adjustments to the mix as determined by his visual observation of the filter operation. The vacuum on the filter is not controlled. With clean cloths and a properly developed cake, the vacuum pump will develop a 15 to 20 in. vacuum in the filter chamber.

67-0737

Moeller, U. On the technology of sludge dehydration. Staedtehygiene, 18(3):54-59, Mar. 1967.

Three stages in the dehydration of sludges are described. In the first stage the interstitial water (approximately 70 percent when the sludge originally had a water content of 95%) is drained. In the second stage the capillary water (approximately 22% out of 95%) is separated by mechanical energy such as suction, filtering, pressure, or an artificial field of gravity in centrifuges. The absorbed water (approximately 8% out of 95%) is removed by thermal engergy (evaporation). The various natural and artificial separating methods applicable to the three different stages are listed in two tables. Differences in behavior of sludges during the dehydration process permits a rough division into three types: sludges which can be easily dehydrated, such as those with larger amounts of sand or coal particles; domestic sludges with a medium dehydration ability; and sludges rich in gels. Designs of dehydration plants are usually based on experimental data. Approximate results, however, are obtainable from mathematical models such as the filter equations by Kubitza, which are presented and discussed. Experimental relationships obtained by the Ruhrverb and in a pilot plant, are illustrated in five diagrams. Filtering can be improved by the addition of flocculants such as metal salts and lime, but care must be taken that the flakes are not mechanically destroyed. (Text-German)

67-0738

Montens, A. Treatment of wastes originating from metal industries. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.908-925.

The treatment of wastes of hot rolling mills, of pickling plants, and the treatment of aged oil emulsions, including combustion plants in particular and plants in West Germany are considered. Wastes from hot-rolling mills must be cleansed of scale and oil in mechanically cleaned settling tanks. The reuse of pickling liquid in iron and steel works is seldom possible. Standard methods of treating pickling wastes include: neutralization, ion-exchange, and regeneration. For the regeneration of sulphuric acid, most plants produce iron sulphate heptahydrate. The treatment of oil emulsions consists of two steps: the cleaving of emulsions and the separation of oil. The processes used for cleaving include: adding salts, adding acids, adding salts and heating the emulsion, adding salts and treating by electricity, or adding acids and organic cleaving agents. For the combustion of oils together with oil-sludge, drum-type furnaces are well suited. Equipment for the treatment of wastes is described and illustrated. The costs of pickling steel strip using hydrochloric acid with an acid recovery system are tabulated.

67-0739

Montgomery, D. R. Integrated system for plant wastes combats stream pollution. Chemical Engineering, 74(5):108-110, Feb. 27, 1967.

A large waste-disposal system is described in which neutralization, solids removal, biological treatment, and centrifuging are all integrated to handle the raw waste from styrene-butadiene rubber and cis-polybutadiene production facilities on the Kanawha River at Institute, West Virginia. The $1.2-million plant treats 2,475 gal per minute of aqueous waste carrying organic solvents, spent catalyst, catalyst residues, and rubber crumbs and fines. The waste-treatment plant neutralizes the input, removes suspended and settled solids, and lowers the BOD level in a biological loop system that recycles activated sludge. The average BOD removal is 90 percent of the input and the final discharge of BOD to the river is essentially 200 lb per day. The plant was able to surpass the requirements of the Water Resources Commission which had set a limit for BOD of 1,000 lb per day for the second phase of an abatement program for the plant.

67-0740

Moore, V. P., and O. L. McCaskill. Methods of collecting seed cotton trash. In Control and Disposal of Cotton-Ginning Wastes; a Symposium, Dallas, May 3-4, 1966. Public Health Service Publication No. 999-AP-31. Cincinnati, U.S. Department of Health, Education, and Welfare. p.29-38.

Seed cotton trash is loosely defined as the material that is removed from the gin building by the high pressure fans. It consists primarily of leaves, burs, sticks, and stems. An analysis of the foreign matter content of machine scrapped cotton in the Mississippi Valley shows that it contains 329 lb of hulls, 143 lb of sticks and stems, and 398 lb of leaves and dirt, making a total of 870 lb of foreign matter per bale. The emissions from the trailer-unloading system consist primarily of dust, fine-leaf trash, and some fibers. The exhausts from the drying and cleaning systems pick up leaf trash and dust from the cylinder cleaners. The exhaust from the live overflow contains a small quantity of lint fly and dust. The cyclones discharge into a screw conveyor that has a dust-tight cover. The conveyor in turn discharges trash through a conventional dropper into an air line that conveys it to a bur house or incinerator. It has been found that by using a cyclone filter unit along with an airwash or second filtering, the air can be cleaned sufficiently to be returned to the gin building. It is doubtful that half of the gins in the United States can afford $20,000 to $30,000 for an elaborate trash collection system.

67-0741

Morris, S. S. The new Cape Town abattoir. Institution of Municipal Engineers Journal, 94(12):415-422, Dec. 1967.

The planning and construction of Cape Town's recently completed abattoir, one of the most up-to-date slaughterhouses in the world, are described in detail. The abattoir is extensively automated and includes many new features and technological improvements, the design having been evolved only after long and detailed investigation of abattoir projects in many parts of the world. It was built at a total cost of £1,665,500 and combines aesthetic adequacy with functional efficiency. Many of the unpleasant tasks normally carried out in a slaughterhouse have been eliminated and high standards of hygiene, public health, and humane operation have been achieved. Among the topics discussed under planning and design are: the site, national policy and control, established local requirements, general layout, basic capacity, process planning, building layout, services, transportation, storage, marketing, equipment, and structural and architectural planning. Construction of the abattoir is discussed, including contracts, concrete structures, building work, and service installations. A detailed breakdown of capital costs is given, with additional comments on operating costs and revenue. A considerable increase in operating costs, as compared with old abattoirs, was expected, so that entrance charges for those making use of the facility will probably be about 60 percent greater than previous charges.

67-0742

Mytelka, A. I., and R. M. Manganelli. Radiation treatment of an industrial waste. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.1025-1043.

A study was made of radiation-induced changes in an industrial waste and the effect of these changes on the biological degradation of the waste. The waste, an azo dyestuff mother liquor, was chosen because of its low biodegradability, its chemical complexity, and its intense color. As the radiation dose from cobalt-60 increased, the chemical oxygen demand, total organic carbon concentration, dye concentration, and color of the waste decreased. The organic compounds remaining in the waste became more amenable to biological oxidation. Oxidation of the waste was favored by alkaline conditions during irradiation, with maximum oxidation occuring at approximately pH 11. Sodium hypochlorite is not as effective an oxidizing agent as are hydroxyl radicals, as was shown by the failure of sodium hypochlorite to reduce the total organic carbon concentration of the waste.

67-0743

Nebiker, J. H., and W. Munz. The dimensions of drying beds for sludges. Schweizerische Bauzeitung, 85(46):830-833, Nov. 1967.

The dehydration of sludges in drying beds is treated mathematically and a cost analysis is presented for three kinds of drying beds. The ratio of the rate of drying of sludge over the rate of evaporation of pure water is a constant close to 1 up to a concentration of 25 percent of solid contents. Evaporation is then reduced because dry patches form on the surface of the sludge and transport of water to the surface is hampered. An equation and a graph for the drying rate is presented. For practical applications the influence of the local climate, particularly the amounts of precipitation, must be considered. As a rule, 25 percent of the precipitation must be subtracted from the evaporation rate. For cost analysis, three kinds of drying beds are considered: open and covered beds with water permeable bottoms and a covered bed with sealed bottom. The meteorological observations of two localities in Switzerland are used and the detailed analysis, including drying times and costs of investment and operation, are presented in two tables. (Text-German)

67-0744

Nemerow, N. L., and R. Armstrong. Prototype studies of combined treatment of wastes from 22 tanneries and two municipalities. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.593-601.

The cities of Gloversville and Johnstown, New York, with populations of 21,741 and 10,390 respectively, are the home of 22 tanneries and 8 other major wet industries including textile dyeing facilities and a glue manufacturer. A prototype tannery waste treatment plant was constructed at the existing Gloversville waste water treatement plant. A two-stage system of biological treatment, employing a roughing filter preceding the activated sludge process, was evaluated as a combined system. The units of the prototype plant are: screens, raw sewage, pump, primary tank, roughing filter, aeration tank, secondary settling tank, and digester. The primary settling tank was operated with and without the use of polyelectrolytes. Suspended solids and BOD removal, without polymer, averaged 48 and 24 percent, respectively. Comparable values, using polymers, were 75 percent and 39 percent, respectively. The tannery wastes in combination with municipal waste water were effectively treated in the two-stage biological plant designed to treat 10 to 15 gpm. BOD reductions in the range of 80 to 90 percent were obtained. No problems of odor were encountered and the varying pH did not appear to affect treatment. The chrome compounds used in the tanning process are in the less toxic trivalent form. Color removal was obtained, although not 100 percent.

67-0745

Nepper, M. Biological treatment of strong industrial waste from a fiberboard factory. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.884-891.

An activated sludge process was chosen by a Belgian fabricator of board in order to comply with a new law concerning the discharge of waste waters into waterways. The waste water coming from the factory passed through a screen. Then, after addition of nutrients, it was pumped to a balancing tank and from there to the aeration tanks. The mixed liquor was sent to a settling tank the overflow of which was the effluent going to the river. The return sludge was pumped from the bottom of the Cyclator. The excess sludge was pumped and sent back to the factory where it was mixed with fibers and put in the board. Major problems encountered were clogging of the aeration grids, clogging of the screen, foam formation, and excess sludge. The best way of disposal of the 4.5 to 5 tons (dry basis) of excess sludge was back into the manufacturing process. For a production of 180 tons per day of board, it is necessary to treat about 2,650 cu m per day of waste water containing 7,000 kg per day. Plant operating data and costs are included.

67-0746

Nettleton, M. A. Burning rates of devolatized coal particles. Industrial & Engineering Chemistry Fundamentals, 6(1):20-25, Feb. 1967.

Burning occurs in two regimes. One is at low temperatures in a chemical-controlled regime where rate increases exponentially with temperature. The other is at high temperatures in a diffusion-controlled regime where reaction rate increases more slowly. Samples were prepared by devolatizing crushed coal at 900 C anaerobically and separating the product by size. The electrically heated furnace and gas preheaters used are illustrated. Rates of burning, R, are related to particle radius, r, and time, t, by: $R = -3/r\ dr/dt$. The burning rate was inversely proportional to the apparent density. Increasing the ash content of Gedling char has a significant effect on the burning rate only with the smallest fractions. Burning rate should be directly proportional to the bulk gas concentration. Swelling characteristics of coals on which the density of the char depends are influenced by their heating rate during devolatilization. The transient temperature is a function of the physical properties of the particles and is higher for chars with low rates of reaction at low temperatures. It is unsatisfactory to heat the regime in which the rate only slowly increases with increasing temperatures. The temperature of a particle burning in a diffusion-controlled regime reaches a steady value given by a heat balance between heat of reaction and heat losses. Particle temperature increases as size decreases. Results are graphed. Data on various coal properties are included.

67-0747

New centrifugal dewaters hard-to-settle solids. Chemical Engineering, 74(6):114, Mar. 13, 1967.

Included are both a description and diagram of a new centrifugal separator which successfully dewaters particles in the micron size-range. The unique concurrent-flow design of this centrifugal separator enables liquid and solids to travel in the same direction, permitting solids to settle undisturbed by incoming feed. Also, solids travel the entire length of the machine, giving better cake compaction. The skimmer pipe position, which can be adjusted while the machine is running, regulates the depth of the liquid pool. Separation efficiency depends on rate of feed and concentration of solids in the feed. The 24-in. unit (an 18-in. diameter is also offered) handles up to 150 gpm of slurry. Though more efficient with low percentages of solids, the unit can handle feeds with up to 30 percent solids. Flocculating chemicals can be added when needed.

67-0748

New packing solves sludge pump problems. Public Works, 98(9):96-97, Sept. 1967.

The experiences of two sewage treatment plants that switched from square braided mechanical packing to 600 W Parachute Mechanical Packing and Chesterton Style 322 White-Lon Mechanical Packing, are described. The sewage treatment plant at Dover, New Hampshire, experienced constant difficulty with pump leakage when square braided graphite packing was used. This required a daily hosing and brushing of each pump. Since switching to the Chesterton's Style 600 W Parachute Mechanical Packing in February 1966, no leakage has occured three months later. The parachute rings seal individually by providing two degrees of bevel in their contacting surfaces, and another ring can be added if leakage should occur. With the old material, the annual cost of labor and materials amounted to $1,486.81 for maintaining the six pumps. By using the new material, the cost amounted only to the cost of material and labor for one repacking, a total of $384.04. The sewage treatment plant in Hanover, New Hampshire, experienced the same leakage difficulties with their two plunger type sludge pumps. Substitution with the Parachute 600 W provided a better seal and repacking was not required for 13 months. Annual savings amounted to $250.00. The centrifugal pumps operated with the usual leakage prior to installation of Chesterton Style 322 White-Lon Mechanical Packing. Since installation of the Style 322, 840 gpm pump has required repacking at intervals of about 5.5 months. The second of the two pumps required repacking at 11.5-month intervals.

67-0749

New polymer-carbon system treats organic waste water. Plant Engineering, 21(3):160, Mar. 1967.

The Calgon Corporation of Pittsburgh has developed a new waste treatment process which offers real hope for solving industrial organic water pollution. Industry can now discharge a better quality water to receiving streams at less total cost than presently accepted treatments. The process also requires less equipment and only one-tenth of the land area needed for a three-stage operation, besides being better able to meet emergencies. New, effective polymeric water treatment chemicals are used with granular activated carbon filters. The clarified water then passes over the filter beds where remaining suspended solids are removed and the carbon adsorbs dissolved organic contaminants. After the secondary stage, water is chemically treated to remove phosphates, filtered, and passed through steel tanks containing granulated carbon. The water is now clear, odorless, and safe for drinking following chlorination. Included diagrams portray the process.

67-0750

New sewage disposal works for Oakengates UDC. Surveyor and Municipal Engineer, (3920):31, 32, July 22, 1967.

Under previous arrangements, sewage from the outfall sewers was passed through settlement tanks before being discharged to the land via distribution channels. The effluent was collected into underdrains. Constantly using land in this way resulted in the deterioration of the quality of effluent discharged to the stream. A new works costing £357,000 opened. It is based on a dry weather flow of 800,000 gpd. Sewage is conveyed to the site gravitationally by two main sewers. After coarse screening, the sewage is passed through disintegrators. Heavier material is removed by mechanically operated dredgers. Liquid contents are treated fully and sludge is pumped to the sludge treatment units. Material is filtered; the effluent is passed for secondary sedimentation to three vertical flow humus tanks before being discharged into the stream. The sedimentation tanks and storm water tanks are provided with electrically operated sludge-scraping and scum-removal equipment. Sludge from the humus tanks is bled off continuously by hydrostatic valves to a pump for re-treatment.

67-0751

New sludge pressing plant for Long Eaton UDC. Surveyor and Municipal Engineer, 80(3922):24-26, Aug. 5, 1967.

The open bed system at the sludge drying section of the Long Eaton, Notts, UDC's Toton Sewage Treatment works was abandoned when the new sludge pressing plant was opened in July 1967. The open bed system which had been seriously overloaded for five years was too dependent on favorable weather conditions and was also the cause of many complaints from the odor. In the plant, 42,000 gal of sludge are passed through a rotating cutter to make certain that large objects which might damage the pressing plant are cut up or rejected, and then passed to the holding tanks where any supernatant liquid is skimmed off. The sludge is then moved from the holding tanks to the treating tanks where lime and ferrous sulfate are added and finally the treated sludge is filtered through filter cloths of PVD material at 100 lb per sq in. The final sludge cake has a moisture content of 65 percent, which can be stored in the open without reverting to a slurry. The design capacity is for 70,000 population at 0.18 lb of dry solid per person per day, but plans are being made for expansion although the present population is only 55,000. Illustrations show a general view of the plant, showing the lime silo, the press house and conveyors, a general view, showing the ferrous sulfate and treating tanks, the ground floor of the press house showing the sludge transfer pumps, the first floor of the press house showing four filter presses and the control panel, and the final sludge cake broken down into cobbles ready for disposal.

67-0752

Odom, J. J. Removing LAS and ABS from sewage. Public Works, 98(1):86-87, Jan. 1967.

A full-scale trial of B-2274, a polymer, to remove ABS and LAS detergents is described as carried out in the Tuscaloosa, Alabama, sewage treatment plant. The process involved is based on the use of a water-soluble amine polymer which reacts with LAS and ABS to form a water-insoluble colloidal precipitate, removable by filtration or sedimentation. Assuming an average content of 7 mg per liter of ABS in incoming raw sewage, 20 mg per liter of B-2274 was added at the weir entrance and temperature, pH, ABS, BOD, and total, suspended, volatile, and settleable solids measured. Treatment was successful, with no adverse effects on BOD or solids removal, and resulted in an effluent containing generally less than 2 mg per liter of ABS. Cost of the treatment, which was applied to one-half of the sewage intake, was about $23.50 per 1,000,000 gal of incoming raw sewage. Possible commercial applications of this polymer are discussed.

67-0753

O'Neal, A. The community gin company's trash collection and disposal system. In Control and Disposal of Cotton-Ginning Wastes; a Symposium, Dallas, May 3-4, 1966. Public Health Service Publication No. 999-AP-31. Cincinnati, U.S. Department of Health, Education, and Welfare. p.63-65.

A Scottsdale, Arizona gin company estimated that they collect 75 lb per hr of dust from their type of ginning system. A water injection system was decided on for fines because disposal would be more practical when the dust was wet than when it was dry. The only problem with this technique was odor, which was controlled with moderate amounts of DK powder. The slurry has been found to be of definite advantage in trash compost piles, accelerating the decomposition of the gin trash. Bur and trash disposal has become an expensive problem because growers do not spread gin trash back on the land. The following equipment has been constructed in series: a large diameter cyclone with vacuum dropper box at the trash outlet to allow operation of the cyclone under negative pressure, an 8,000 cfm paddle blade with a 19 in. water pressure drop across the fan and a 2 in. water pressure after the fan, a 3/8 in. water pipe inserted into each of the inlet lines, and a pair of high-velocity cyclones for collection of fines.

67-0754

Oxidation at a third the capital cost. Civic Administration, 19(12):15, Dec. 1967.

Advantages of the oxidation ditch used in Olds, Alberta, and Montrose, British Columbia, for sewage treatment are listed. It is odor-free and inaccessible to animals. Capital cost is one-third to one-half that of standard compact plants. Power costs are lowest of any aeration system. Only 50 percent of land required for the compact type is needed here. The plant can be built on poor load-bearing soil. The plant has triple the holding capacity and dilution ability of eight-hour standards. Maintenance takes half a day. Treated sludge may be used as a crop fertilizer. Mixed liquor solids can be maintained at a very high ratio. BOD averages 96 percent. Final effluents are nearly microbe-free.

67-0755

Paganini, O. Progress report--air pollution study of cotton gins in Texas. In Control and Disposal of Cotton-Ginning Wastes; a Symposium, Dallas, May 3-4, 1966. Public Health Service Publication No. 999-AP-31. Cincinnati, U.S. Department of Health, Education, and Welfare. p.51-58.

Machine-harvested cotton contains from 150 to 1,000 lb or more of trash. In a modern, high speed gin, the processing of from 12 to 20 bales per hr can result in from 1 to 10 tons of waste. Unless the pneumatic conveying systems are properly designed, thousands of cubic feet of air containing large quantities of entrained dust, lint, trash, and some pesticide residues can be released to the atmosphere. Investigation procedures and findings of a study made by the Texas Department of Health on cotton-ginning operations are summarized. Smoke emitted from incineration of cotton gin waste was found to contain amounts of benzene-soluble organic matter and arsenic, and to reduce visibility to such an extent at times in some locations that driving was hazardous on the highway. Dust and lint concentrations in the air were found to be excessively large. Bacteria and fungi were present in greater amounts in the air sampled downwind from gins than in those sampled upwind. Concentrations of arsenic, pesticides, and defoliants exceeded the concentrations found in the natural ambient air. High-efficiency cyclone collectors appear to be required to handle more material than is normally expected of these units.

67-0756

Parker, R. R. Disposal of tannery wastes. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.36-43.

In considering the treatment of tannery waste and the selection of an optimum method, the type of receiving medium, rather than the effluent, determines the method of treatment. The nature of tannery waste and the composition of effluents are discussed. Screening, followed by sedimentation, or a combined process, are essential first steps regardless of the receiving medium. Sedimentation alone will remove most of the calcium hydroxide and carbonate and with this sludge, hair, and flesh particles. Where space is available, lagoon settling is satisfactory. Partial neutralization, preferably by sulfuric acid, will improve the quality of the effluent. The effluent, after screening, sedimentation, and pH correction, is in general suitable for discharge to a municipal sewer. The waste treatment system of a tannery near Toronto is described in detail. Spray irrigation of waste vegetable tanning liquors was established in a wooded area. Odor problems were solved by changes in spraying schedules. During the spring, effluent is sprayed at the rate of 2 in. per day. Soil deterioration may occur as a result of the high sodium content of the effluent. Disregarding land costs, the installed cost of a spray irrigation system would be approximately $20,000 including pumphouse, pump, electrical connections, and piping.

67-0757

Parsons, W. C. Spray irrigation of wastes from the manufacture of hardboard. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.602-607.

The waste water effluent from the production of hardboard by the Masonite process contains only those natural ingredients which are leached from the wood in the process. The effluent from the mill is fed into a storage lagoon where it is diluted to the desired concentration with fresh water, and its pH adjusted by the addition of anhydrous ammonia. From the storage lagoon it is pumped to the irrigation field area with sufficient head to utilize a standard type of spray nozzle. The irrigation field area was originally planted with a mixture of grass seed but the Reed canary grass finally crowded out all other species. Waste water application began using very low concentrations of approximately 0.25 percent solids and was gradually increased to 2 percent solids. The loading rate was established at 550 lb per day per acre on a year round basis. Costs are moderate, averaging approximately $50.00 per million gallons handled, not including land purchase and depreciation. The system operates best in dry climates and dry weather. Disadvantages of the system are: large amounts of land are required, detailed knowledge of subsurface conditions is required, power costs are high, and there is a possibility of contaminating subsurface water.

67-0758

Pendleton, A. M. Current gin trash disposal practices. In control and Disposal of Cotton-Ginning Wastes; a Symposium, Dallas, May 3-4, 1966. Public Health Service Publication No. 999-AP-31. Cincinnati, U.S. Department of Health, Education, and Welfare. p.39-44.

Since most of the U.S. cotton crop is now harvested by the spindle picker or stripper, the gins must be geared to handle the volume of trash gathered by these two methods. In 1964, machine-picked cotton carried about 89 lb more trash and moisture than handpicked cotton did. The trash problem is much more difficult where machine stripping is practiced. Three principal pieces of equipment are used to collect trash: the cyclone, the lint fly catcher or screen cage, and the inline filter. A cost of $29,049.50 was estimated for installation of a complete cyclone system, an in-line filter trap system, and a commercial incinerating system, including power and auxiliary equipment. The system was priced with a dust collection house and one complete spreader truck. This arrangement is designed for returning the gin trash to the soil. Approximately 37 percent of the gins in the United States incinerate the trash, 58 percent return it to the land, and 5 percent handle it in some other manner. Conveying cotton trash over a screen before spreading on land may eliminate its grass and weed seed content. In Texas, composted cotton trash has a fertilizer value of $7.50 per ton.

67-0759

Phosphoric acid process produces purer gypsum by-product. Chemical Processing, 13(9):30-32, Sept. 1967.

The hemihydrate phosphoric acid developed by the Nissau Chemical Industries of Tokyo is described. The process used gives a higher yield than the conventional processes and produces a by-product of high-grade gypsum which eliminates the waste-gypsum disposal problem of most phosphoric acid plants. A simplified flow sheet is shown of the sequence of the operations: proportioning and mixing of sulphuric acid and calcium phosphate; digestion at 90 C to produce calcium sulfate hemihydrate; solution in the crystallizers and recrystallization of the calcium sulfate as the dihydrate at 65.55 C. The phosphoric acid is separated by filtration on a Landskrona-type belt filter at 55 C. Also given is a photograph of a phosphoric acid plant and a picture of the gypsum crystals obtained to emphasize the freedom from occlusions, the uniformity, and the size of the crystals. Advantages claimed for the Nissau process include a lower incrustation velocity of equipment and piping because of the lower temperature of filtration. The piping, equipment, and filters have longer operating time between cleaning, and the formation of foam is completely suppressed. Troublefree operation, a substantial degree of automation, and a simple process allow a minimum of personnel. In this process any occlusions of phosphate are liberated when the hemihydrate is recrystallized to the dihydrate. The gypsum obtained can be used in the manufacture of plates, flagstones, and preparation of ammonium sulphate.

67-0760

Pipes, W. O. Bulking of activated sludge. Applied Microbiology, 9:185-234, 1967.

Separation of the microbial population from the purified waste in the sedimentation tank was investigated in a study on the proper operation of the activated sludge process. Among the many aspects discussed are: the types of settling problems involving floc formation, density, and compaction; superficial aspects of bulking such as plant operation, waste composition, and aeration tank environment; fundamental aspects of filamentous bulking such as hypotheses about the mechanisms of filamentous bulking and filamentous bulking organisms. One of the reasons that the settling problem cannot always be solved is that the different phenomena which cause problems with settling have never been clearly defined. There are at least ten different types of sludge which do not separate properly in the sedimentation tank and all ten of these have been called 'bulking sludge' at one time or another. Research on filamentous bulking has been rather confused due to a failure to identify the organisms involved. Seventeen statements are given which are useful guidelines when attempting to discover the cause of a particular case of bulking, but they need to be either verified or disproved before a useful theory of filamentous bulking can be developed.

67-0761

Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. 1122 p.

Eighty-five papers were presented at the 22nd Industrial Waste Conference sponsored by Purdue University in conjunction with the Indiana State Board of Health. Waste treatment and pollution control facilities systems of food processing plants, tanneries, paper mills, and metal industries were discussed. The various systems included spray irrigation, lagoons, activated sludge processes, and oxidation ditches. Countries represented are: Belgium, the Netherlands, Great Britain, South Africa, Germany, New Zealand, and Japan. The text includes many charts, graphs, and photographs, and many of the papers have extensive bibliographies. At the end of the second volume there is an author and subject index to the last ten Proceedings that have been published.

67-0762

Pyro-decomposition destroys oil wastes. Public Works, 98(1):118, 120, Jan. 1967.

The Marathon Oil Co. Research Center in Littleton, Colorado installed a Prenco Standard Model SF-1 pyro-decomposition system to dispose of its waste material, which includes both petroleum light ends and heavy ends. The system was designed to use fuel oil as an auxiliary with a capacity to dispose of fluidized waste materials at a rate of 3,360 gal per week. Operation is in the range of 2,000 to 2,700 F. Due to the fine dispersion of waste combustibles and to the extreme heat, atomization and ignition are almost simultaneous and as pyrolite cracking or dissociation occurs, the molecular bond of each constituent is broken. There is no smoke, no odor and no visible ash; the waste products are completely consumed.

67-0763

Rao, S. V., and N. L. Lahiry. Fishery byproducts. Journal of Scientific and Industrial Research, 26(2):87-88. Feb. 1967.

A brief, critical review is given of 'Fishery Byproducts', a book by Julius Brody (AVI Publishing Co. Inc., Westport, Conn., 1965). The book deals exclusively with the byproducts of the fish processing industry and is of particular significance to developing countries. The economics of food processing are intimately connected with the efficient utilization of byproducts. An extensive bibliography is available at the end of each chapter. The reviewers mention a number of items which they feel would have made the book more comprehensive had they been included.

67-0764

Rasch, R. Elimination of industrial waste. Tonindustrie Zeitung und Keramische Rundschau, 91(4):136, 1967.

At a meeting of the Association for Manufacturing Processes and the Dechema Association (Assoc. for Chemical Apparatus) in March 1967 in Stuttgart, the incineration of industrial waste was discussed. It was stressed that industrial waste is far more difficult to incinerate than domestic waste. Extracted plants, salts, and tablets will not burn easily. Paper and domestic waste must be added for efficient incineration. The highly viscous and melting parts in the waste pose great problems. Experience shows that a rotating tube furnace is best suited for the incineration of industrial waste. (Text-German)

67-0765

Reh, L. Incineration of industrial sludges. Chemie-Ingenieur-Technik, 39(4):165-171, Feb. 1967.

Industrial sludges are incinerated in all cases in which the components can be converted into innocuous or usable gases or into ash which can be safely deposited. The type of incinerator used depends on the combustibility, volatility, and toxicity of the components; the water contents; the mineral substances; and the corroding agents contained in the sludges. The content of combustible substances varies greatly in industrial sludges so that incineration needs a high amount of excess air which has such disadvantages as poor heat utilization, higher losses in waste gases, and an increased formation of SO3. Some problems, including clogging of supply pipes and nozzles, explosions, and toxic metal compounds in the sludges are discussed. The rotating atomizer incinerator is insensitive to fluctuations in the viscosity of the sludges and to clogging by solid particles. The atomizer furnace, operated with compressed air or steam, avoids clogging problems and eases the load on the pumps. The radiation chamber incinerator is especially suited for wastes which have a high heating value and a high content of suspended particles. Sludges which cannot be sprayed into the combustion chamber through nozzles and which contain volatile hydrocarbons can be incinerated in the fluidized bed furnace. Illustrations and brief descriptions of the functioning of all the furnaces mentioned are given. (Text-German)

67-0766

Reiche, H. The incineration of sulfate waste liquors. Papier, 21(10, 11):593-597, 834-837, Oct.-Nov. 1967.

After a brief description of the best known methods (such as the Tomlinson, Combustion, and Gadret methods) for burning sulfate waste liquors, the chemical and physical properties of the liquors important for incineration are discussed and illustrated in diagrams. The specific weight increases with rising temperature and increasing water contents. The viscosity increases progressively with decreasing water contents and falling temperature. The chemical compositions, softening points, heating values and basic analysis of the waste liquors are tabulated. The air and flue gas amounts are plotted in a diagram as functions of the dry substance content. An investigation of the condition of flow can occur in pipes with conventional diameters of up to 120 mm. Pressure fluctuations occur at the changeover from turbulent to laminary flow. To avoid this, the waste liquor must be thickened and heated up according to the operational requirements, so that a laminary flow is achieved and maintained. A diagram for the graphic determination of the condition of flow is given. For the injection, the cross section of the pipe, the viscosity of the waste liquor and the injection pressure are of importance.

High pressure increases the injection speed and the atomization. During the injection of thickened waste liquor, the boiling point must not be reached in the Tomlinson incinerators, but it can be exceeded in Combustion and Gadret incinerators. Measurements of the incineration temperature and of the (CO + H2) contents in the reduction zone of Tomlinson incinerators show that there is not always a continuous flow of waste liquor into the reduction zone. The occurrence of locally and temporally limited temperature peaks, and the vaporization of a corresponding amount of sodium salt, cannot be entirely avoided. (Text-German)

67-0767

Removal of refinery wastes; sampling and analyses of waste water. Wasser Luft und Betrieb, 11(10):600-603, 1967.

The American Petroleum Institute developed methods for the treatment of oil containing waste waters which are also of interest for German conditions. In the present article excerpts are given of U.S. methods of sampling and analyzing refinery waste waters. Two samplers are described; one skimmer with rotating cups and an electrical sampler containing a pump, an electrically controlled valve and a timer. Also, pH meters, electrodes, and standard solutions for electrometric titrations are described and methods for the determination of suspended particles, hydrogen sulfide and total sulfur are outlined.

67-0768

Reynolds, T. D. Aerobic digestion of waste activated sludge. Water and Sewage Works, 114(2):37-42, Feb. 1967.

Aerobic digestion, treatment of waste activated sludge, is based on the principle that biological cells will use their own cell material and dead cells present as food if there is no external source of nutrients. Results from tests in a biosorption plant in Austin, Texas, using primarily domestic waste showed that values for 95 percent stabilization varied from 3.5 to 5.7 days. The digested sludge had a dark brown color, did not have an offensive odor, and readily gave up its water when poured on a sand drying bed. For plug flow conditions which exist in tanks that are extremely long and narrow, once the degree of desired stabilization is known, the detention time and the oxygen uptake rate may be computed using equations given in the article. Derivations of these equations, using calculus, and graphs, are included. An adjustment to the oxygen uptake rates must be made since actual flow conditions will be plug flow with dispersion. Data on required aeration volumes for a 1.0 mgd biosorption plant are given.

67-0769

Richert, D. A., and J. V. Hunter. Rapid fractionation and materials balance of solids fractions in waste water and waste water effluent. Journal of the Water Pollution Control Federation., 39(9):1475-1486, Sept. 1967.

A suitable separation procedure for solids in waste water could provide information on sewage and sewage treatment which might result in improved treatment methods. In the separation method developed in this investigation, the fractionation is accomplished by settling and continuous-flow centrifugation, first at 14,000 rpm and then at 50,000 rpm to obtain four fractions: settleable (greater than 100 micron); supra-colloidal (100 to 1 micron); colloidal (1 micron to millimicron); and dissolved (less than 1 millimicron). Electron micrographs are shown of the waste water effluent solids removed and discharged from a centrifuge operating at 14,000 rpm and at 50,000 rpm. Tables are given of the solids distribution of the plant influent and effluent at two municipal treating plants. Bar charts are given showing the contribution of the waste water fraction to the total solids, the percent of the recovered total solids in each fraction, the contribution of the fractions to the volatile solids, and the contribution of the fractions to the total solids for the two municipalities which are nearly identical. A table shows the solids reduction resulting from activated sludge treatment. In the influents, the total solids were 14 percent settleable, 11 percent supra-colloidal, 6 percent colloidal, and 69 percent soluble, while in the effluents 98 percent of the total solids were in the supra-colloidal fraction. The solids reduction in the activated sludge treatment was: 42 percent of the total solids; 66 percent of the volatile solids; 86 percent of the particulate total solids; and 20 percent of the soluble total solids. The activated sludge treatment was efficient in reducing particulate organic matter, but inefficient in reducing soluble organic matter.

67-0770

Roediger, H. Sludge disposal with or without activation? Wasser und Abwasser, 108(18):492-494, May 5, 1967.

Wet sludge disposal is by far the most economical method amounting to only 6 DM per cu m of dry sludge. The activated sludge from the last rotting stage or from the after-thickener can be immediately used as a fertilizer. Pasteurization of the activated sludge at 70 C makes it a useful fertilizer all year round. Next to the wet sludge disposal comes the dehydrating and drying of the activated sludge at about 10 DM per cu m of dry sludge. Contrary to the wet sludge disposal this method requires a large drying area. The activated sludge dried naturally or artificially can be composted together with household trash or organic wastes. They make an ideal compost. Sludge which is not suited for natural drying must be mechanically dehydrated, dried, and burned. For the dehydration either vacuum filters, pressure filters and filter presses, or vibrating sifts, or separators can be used. For incineration the mechanically dried sludge is often mixed with waste. But this method of sludge disposal is expensive since high investment and operating costs are involved (the operating costs for vacuum filters alone are 18 DM per cu m dry sludge). Thus expenses increase when non-activated sludge must be treated. Activating the sludge prior to disposal has many advantages over not activating. Eighteen of them are mentioned of which the most prominent are: the volume of the sludge can be reduced to one-third of the non-activated sludge; dehydration is simpler; valuable sewer gas is obtained; disposal of wet sludge is possible; and it is more economical and hygienic. Furthermore the sewer gas can be used to dry and pasteurize the activated sludge. (Text-German)

67-0771

Rub, F. Equipment for the mechanical introduction of air in biological waste water treatment. Wasser Luft und Betrieb, 11(10):604-606, 1967.

Biological waste water treatment became important for treating domestic or industrial waste waters containing predominantly organic pollutants. An essential part in the biological treatment is stirring and the introduction of air or oxygen. Equipment for the mechanical introduction of air can be divided into two categories, i.e. cage, brush, or disk type stirrers with horizontal axles; or mixers with vertically arranged rotors. Cylindrical cage type stirrers driven by a 5 kw motor can be used in oxidation ditches. Disk stirrers built by TNO-Passavant have been successfully used for refinery waters. The mammothrotor stirrer, shown in the illustration, is 7.5 m long and 1 m in diameter, driven by a 55 kw motor at 65 rpm and has an efficiency of 91 percent. Rotor type stirrers with vertical axles, e.g. the British Simplex rotor, became increasingly popular in Germany. These stirrers with series or individual drives are automatically controlled in response to the oxygen concentration. The Vortair aerator with 0.5 to 75 kw drives has been developed in the U.S. for domestic or industrial wastes. Air is introduced in two ways: by spraying water above the water level and injecting air into the water. The Simcar aerator consisting of a flat cone with vanes simultaneously mixes the waste and introduces air. (Text-German)

67-0772

Samuels, L. J. A new look at sludge disposal. Public Works, 98(10):176, Oct. 1967.

The Holo-Flite screw conveying dryer was developed to facilitate sludge disposal. It uses self-cleaning intermeshed screws through which a heating fluid is pumped. The processed sludge is introduced at the inlet and is moved by the rotating screws to the outlet. Hot oil flows continuously through the hollow screws and through walls. The resulting material is dry enough to burn in present incinerators and two performance tests under actual working conditions are described. Moisture was reduced to approximately 50 percent and, at one plant, the incoming sludge flow rate was reduced from 4,000 lb per hr with 75 percent moisture to 1,500 lb per hr of an easily disposable product. In a proposed design of a 5-step Holo-Flite dryer, with an input of 25,000 lb per hr of sludge at

77 percent moisture, moisture is expected to be reduced to 25 percent. The 5-pass unit, which is illustrated in a flow sheet, would be 26 by 7 by 15 ft. The drying phase of a typical installation would, on a 25,000 lb per hr disposal plant, consist of 5Q2420-6 Holo-Flite processors for drying, and a 23-million Btu per hr gas-fired heating system to heat the transfer fluid. Total cost of such a system, using stainless steel, including all auxiliaries, and completely automated, would be about $400,000.

67-0773

Sankey, K. A. The problem of sludge disposal at the Arnfield treatment plant. Journal of the Institution of Water Engineering, 21(4):367-384, June 1967.

A study made of the problem of dewatering and drying large quantities of sludge is reviewed. Main experimental work was confined to these methods: wedge-wire filtration, rotary-vacuum filtration filter pressing, slow-stirring, chemical conditioning, and reflocculation. The first three processes were most successful in producing a partially dried sludge suitable for final land disposal. Rotary-vacuum filtration was decided to be impractical because of high running costs. Wedge-wire filtration required high initial outlay, but maintenance is not costly. A large area is required to allow full drying of the sludge on incorporated slow-stirring tanks followed by filter pressing. A schematic design of the final plant is given.

67-0774

Schroeder, E. D. Recent advances in design and operation of activated sludge processes. Water and Sewage Works, 114(8):307-312, Aug. 1967.

Although good design should be based upon the operating characteristics of the process, with the design and process closely related, this is not the case in the traditional design of activated sludge processes where the design gives no information on the process. However, based on the information now available on the rate of bio-oxidation and the rate of microbial growth, operation and design can be related and this paper describes the development and application of these concepts. The design of activated sludge treatment processes has traditionally relied upon formulas and procedures derived from experience. The differences between the 'types' of activated sludge processes are minor compared to their similarities since they all make use of a fluidized flocculant culture of microorganisms. The modifications in the processes differ in the flow of micro-organisms. The modifications in the processes differ in flow sheet and loading, but not in the principle of operation. Flow sheets are given of the activated sludge process, an aeration tank, and a tubular reactor. In the design and operation of activated sludge processes the rate of oxidation is the fundamental parameter. The rate relationships given in the literature are empirical and in each waste treatment process studied, the rate relationships should be supported by experimental data. The data needed for the design and operation of activated sludge processes using the unit oxidation rate can be obtained easily. The application of currently available information, although incomplete, would benefit both designers and operators.

67-0775

Schuster, H. Technical processes for the treatment of waste waters in the fuel industry. Wasserwirtschaft-Wassertechnik, 17(6):202-205, June 1967.

A survey of the present state of technology of waste water treatment is given. While chemical processes are mentioned, the larger part of the paper is devoted to biological processes. Various methods of aeration of tanks are described. New strains of bacteria are being bred which are able to endure higher temperatures and are capable of attacking specific chemical substances. Sludges deriving from biological processes are potentially rich in vitamins of the B-group. Their extraction, however, is not yet satisfactory. In order to incinerate sludges, they first have to be dried. This is done by heating in vacuum or by filter presses. Furnaces are usually of the revolving disc type. The ashes may be dumped at selected sites, or, if the metal content is high, further processed. A test for the quality of the waste water treatment is the reusability of the cleaned water. (Text-German)

67-0776

Septic tank practices. Public Works, 98(1):118, Jan. 1967.

A questionnaire addressed to installers of septic tanks in Connecticut revealed design and construction practices and problems. From the 195 questionnaires mailed, replies were received from 41, which represented a 21 percent response. The experience of the respondents ranged from a low of 2 years to a high of more than 50 years, with the average years of experience being 15.7.

67-0777

Sewage treatment in San Francisco. Public Works, 98(10):174, Oct. 1967.

The methods of operation of three sewage treatment plants—the North Point, the Richmond-Sunset, and the Southeast—in San Francisco, are described. At each plant, sewage is treated to remove oil, grease, floating material, grit, and settleable solids. Grit from all plants, and screenings from the North Point and Southeast plants, are hauled by truck to the garbage fill south of the county line. Screenings at the Richmond-Sunset plant are incinerated and sludge at this plant is digested in two-stage digesters, elutriated by vacuum filtration. Raw sludge from the North Point plant is pumped to the Southeast plant where it is combined with the raw sludge from this plant for treatment by thickening, two-stage digestion, elutriation, and vacuum filtration. The filter cake, except for a small portion used in City parks as a soil conditioner, is hauled under contract to the fill for burial.

67-0778

Slashing sludge costs. Chemical Week, 101(23):67-68, Dec. 2, 1967.

A new device called Clear-Pak, developed by American Machine and Foundry's York Division to remove sludge from phosphatizing solutions, is described. Clear-Pak was adapted from a device (Solid-Pak) that the company patented several years ago for removing sludge from radioactive waste streams; and steps are now being taken to adapt Clear-Pak for use with any chemical processing operation where sludge must be removed from a liquid. The operation of Clear-Pak is not only simple, foolproof, and maintenance-free, but is one-quarter the cost of methods now in use. Thick sludge from the phosphatizing tank is pumped into the distribution header, a small open tank with four holes in the bottom. The solution flows through these holes into four cylinders made of a specially woven polyester filter cloth, hung from the bottom of the distribution header. The bottoms of these filter 'socks' are blocked off, and the solids trapped inside. The liquid flows through and down the outside of the cylinders into an open reservoir, then returns by gravity to the phosphatizing tank. An overflow line, sized to take the full flow of the pump, returns backup fluid from the cylinders to the phosphatizing tank. When the cylinders fill with solids, a handle bar is operated manually to open the closures at the bottom and to drop the solids into a drum. In this way, large quantities of solids are disposed of with a relatively small system, usually dropping 200 to 300 lb of sludge (on a dry basis) with each dumping.

67-0779

Sludge disposal by dewatering and combustion. Water and Wastes Engineering, 4(10):64-67, Oct. 1967.

In the field of sewage sludge disposal, techniques such as lagoons, drying beds, and landfills are in increasing disfavor, because of area factors, handling procedures, health aspects, and public opinion. Combustion of waste sludge solids, on the contrary, offers the maximum in volume reduction to yield a sterile ash and is becoming more common. A description of the combustion of fluidized sludge by the operation of the Dorr-Oliver's FS disposal system is given as a method of sludge disposal. A cutaway view of the FluoSolids reactor shows the bed of hot fluidized sand into which the dewatered sludge is fed. Air is fed into the bottom of the reactor to fluidize the combustion bed. A schematic diagram is shown of the FS disposal system including the sludge preparation for the reactor. A photograph is shown of a 9-ft ID FS reactor with a capacity of 840 lb per hr of dry sludge which had been dewatered in a vacuum filter. A picture is shown of concentration of ash and its discharge from a rake classifier. A table shows a typical stack gas analysis with a dust loading of 0.05 grains per scf, a carbon dioxide of 15.5 percent, an oxygen of 4.0 percent, and nitrogen of 80.5 percent. There is no odor since the system operates at a minimum of 1,400 F exit temperature. Preheating of the incoming air used for fluidization and combustion to 1,000 F using the hot gases from the reactor decreases the auxiliary fuel required and increases the solid capacity by 25 percent.

67-0780
The sludge disposal problem. Water and Waste Treatment Journal, 11(5):218-219, Jan.-Feb. 1967.

The sludge disposal and trade effluent problems which are responsible for most of the operational difficulties in water pollution control plants are reviewed. The best method of making sewage and organic wastes innocuous is incineration. The Carbofloc process, which is based on agitation with carbon dioxide of sludge from a thickener to dewater the sludge which is centrifuged after passing through another thickener, is designed to produce a centrifuge cake of optimum characteristics for multiple hearth incineration. Mention is made of the use of prefabricated filter media for the treatment of sludge liquors. More sophisticated methods of sludge dewatering are giving liquors that are stronger than many trade wastes. This will be the starting point of further research whereby strong organic liquids from sludge dewatering can be pretreated in a manner similar to that used for trade wastes.

67-0781
Sludge disposal to land. Water and Waste Treatment, 11(9):407-408, Sept.-Oct. 1967.

In view of the increasing interest in the application of sludge disposal to agricultural land, and especially in the liquid form from tankers, questions have been raised as to the disposal at unfavorable periods of the year and possible adverse effects of the sludge on the land or on the crop. Two summaries of opinions on the harmful effects are given. Mr. J. W. Blood feels that an important source of soil contamination is sewage sludge from urban areas which accept industrial effluents into their sewage purification plant. It was felt that sewage sludge from most rural sources and from some urban districts could be used without question. To be as effective as a bulky organic manure, sewage sludge must be applied at heavy rates. After plowing, the sludge remains in a compact layer with little mixing with the soil and thus any concentration of metals may affect plant growth especially in the first year. After the first year, the more intimate mixing of the soil and sludge during cultivation dilutes the concentration of metals. It was also indicated by Mr. E. G. Coker that impurities in common fertilizers such as superphosphate cause no apparent ill effects because of their infrequent use in moderate amounts. Thus, any possible ill effects from the application of sludge to the land could be minimized by spreading the sludge thinly over a large area of farmland at infrequent intervals. The use of liquid digested sludge directly on grassland is preferable to the application of crushed dried sludge.

67-0782
Smith, H. S. Homogeneous activated sludge. I. Principles and features of the activated sludge process. Water and Wastes Engineering, 4(7):46-50, July 1967.

In this three part article, the principles of biological oxidation upon which the activated sludge process is based are reviewed and the environmental features of common activated sludge variations are examined. A sketch of the aerobic oxidation cycle shows how the biodegradable organic material in a waste water organism system containing free dissolved oxygen is biologically oxidized to produce energy and to synthesize new cellular substance, carbon dioxide, and water. Activated sludge is the gross mass of viable cells and their associated solid products. When a batch of waste is seeded as in an activated sludge system, a sketch shows the phases, which include the lag phase during which the BOD removal is small, and the log growth phase during which growth and BOD removal are proportional to the number of organisms present. Growth is limited during the declining growth phase and all removable BOD disappears at the end of this phase which precedes the auto-oxidation phase. In a consideration of the variations of the process, a sketch shows the smaller food-to-organism ratio with step aeration, compared to the traditional system. In contact stabilization, mixed liquor undergoes a short period of contact aeration and the return sludge undergoes a longer period of aeration or stabilization. This system makes available a store of sludge mass which can be used to reduce the food-to-organism ratio or to increase the absorption ratio in the aeration tank to handle higher loads.

67-0783

Smoke and litter problems. Lancashire firm takes remedial action. Waste Trade World, 110(2):3, Jan. 14, 1967.

Problems arising from black smoke pouring from the chimney of a waste paper mill in a residential area are described. Residents petitioned the local public health committee for remedial action, claiming constant black smoke and vermin as complaints. The petitioners were informed that the firm was taking active steps to remedy the situation. The firm contacted the National Coal Board, who are sending an expert to give advice about the chimney smoke, which is caused by insufficient supplies of air which prevent complete combustion. However, with a material as volatile as paper, it is impossible for combustion to be sufficient without artificial aids. Oil or gas is generally introduced which provides the additional heat necessary to complete combustion, and this is used in conjunction with mechanical smoke abatement equipment involving filters and collectors. The Ringelmann Chart is a guide as to whether or not industrial smoke is dark enough to contravene the Clean Air Act.

67-0784

Spicher, R. G., F. J. Agardy, and G. T. Orlob. Cannery waste treatment. 1. In-plant characterization. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.44-66.

The first phase of the research program planned by the Cannery Research Advisory Committee of the California State Water Quality Control Board consists of physical, chemical, and biochemical characterization of inplant waste streams and composite flows resulting from processing of peaches and tomatoes. The cannery operation is described and illustrated in schematic diagrams. Methods of selecting sampling locations, collecting samples, and analyzing samples are given. Only some of the data collected during the 1964 and 1965 campaigns are included. Isolation of lye peeling rinses from tomato processing tended to concentrate BOD and SS near the head of the operation. Machine-picked tomatoes appeared to contribute as much and probably more solids and BOD to the waste water than did the hand-picked tomatoes. The total effluent load was found to be sensitive to in-plant water re-use practices. Peach processing produced about twice as much BOD in the plant effluent as did tomato processing. Results of analyses made of screened wastes from revolving and vibrating screens used by the cannery did not indicate any significant difference in the quality of the screened effluents.

67-0785

Spitzer, E. F. Cities play major role in eutrophication. American City, 82(8):99, 128, Aug. 1967.

The present world knowledge of the problem of eutrophication, and what can be done to reverse or slow the process, was discussed at the first International Symposium on Eutrophication held at the University of Wisconsin, Madison, Wisconsin on June 11-16, 1967. It was pointed out that the cities contribute significantly to the eutrophication of our lakes and streams. Industrial and domestic sewage, even after treatment in sewage treatment plants still contains considerable amounts of phosphate and nitrates. Tabulated data show the consistuents of urban drainage which contribute to eutrophication of our waterways. An example is Lake Erie, where since 1930 ammonia nitrogen increased fivefold, total nitrogen threefold, and phosphate concentration has doubled. The following suggestions made to keep nutrients out of lakes and streams or reduce their concentration were discussed: diversion of the sewage, irrigation using the sewage, stabilization ponds, dredging the bottom mud, harvesting the plant growth, and sewage treatment. Lake Washington was cited as an example that the eutrophication process can be slowed and reversed. The Metropolitan Seattle communities have spent more than $120 million on sewage collection and treatment in the past few years, and most of the system was designed to clean up Lake Washington. The results have been definite signs of regression in eutrophication.

67-0786

Stalmann, V. The concentration of waste water sludge. Wasser und Abwasser, 108(18):485-487, May 5, 1967.

The high cost of waste water treatment can be lowered by concentrating the sludge to a consistency where it is still pumpable. This is particularly true for activated sludge. The continuous sedimentation process is advantageous for large daily amounts of sludge where fresh sludge is continuously pumped into the sedimentation tank while the concentrated sludge is sucked away from the botton of the tank. Data from the available literature, results of laboratory experiments, and operating data from a pilot plant are summarized in nine graphs, showing: volume and concentration of sludge vs. time with initial concentration as a variable; achievable concentration vs. content of organic substances; concentration of solids in the clear water vs. depth of the tank; achievable concentration vs. solids per cu m and vs. solids per sq m of surface; viscosity vs. concentration; organic substances per cu m activation tank (in kg), and activation time; and annual costs vs. population with sludge concentration as variable. A decisive factor is the maximum ratio of solids (kg) to tank surface (sq m) per day. Normally this value is taken to be 50 kg per sq m per day. A city of 40,000 produces 1,000 kg solid sludge per day and would thus need a tank of 20 sq m. Concentration of sludge is economically advantageous since a smaller activation tank is needed and a higher yield of gas is obtained. (Text-German)

67-0787

Standard Methods Committee--Subcommittee on Biodegradability. Required characteristics and measurement of biodegradability. Journal of the Water Pollution Control Federation, 39(7):1232-1235, 1967.

Biodegradation is the conversion of chemical compounds, potential pollutants, to innocuous substances through the action of living organisms. The biodegradability of wastes is an important factor in the economics of process and site selection for disposal. Measurements need to be simple and inexpensive. Analyses for biodegradability must be supported by correlation of the test results with the true biodegradability of the material in the environment or treatment system of interest. Important variables include: chemical structure of the test material; nature of the biological system; substrate, nutrient, and microorganism concentrations and ratios; temperature and oxygen supply: agitation; pH; etc. Procedures for estimating persistance of unacceptable materials should cover biological waste treatment facilities such as activated sludge or trickling filters and anaerobic systems such as cesspool, septic tank, and digestor.

67-0788

Stander, G. J. Treatment of wine distillery wastes by anaerobic digestion. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.892-907.

A full scale plant was constructed by the National Institute for Water Research of Pretoria, South Africa, to investigate the treatment of wine distillery wastes. The plant used was a modified 'Dorr-Oliver Clarigester' of 40-ft diameter, with a digester compartment of 23,000 cu ft. A diagram of the full-scale plant is presented. Digester performance, load rates, temperature, sludge metabolism, digester solids concentration, sludge stabilization, volatile fatty acids, and nitrogen content of digester sludge are discussed and data are tabulated. Process control evaluations included: effect of temperature, sludge density, availability of nutrients, and continuous digestion and sludge stability. It was estimated that anaerobic treatment of spent wine would amount to 56 cents (1 South African cent = 1.4 U.S.A. cents) per 1,000 gal. The modified clarigester unit is easily controlled and operated by normal sewage works personnel. Proper acclimatization of sludge eliminated the need for re-inoculation practice and rendered the sludge resistant to shock loads and sudden adverse temperature changes. The purification afforded was consistently above 96 percent. The gas liberated from the digestion process amounted to 14 volumes per volume of spent wine and constitutes a potential heat source.

67-0789

Stauffer, F. H. New ways for processing sewage sludge. Staedtehygiene, 18(3):63-65, Mar. 1967.

The principle of operation of the ZIMPRO-System for the wet oxidation of sewage sludge is described. Invented more than 20 years ago in the United States, it is an efficient and economic method for reducing the content of organic substances of sludge and rendering it sterile. According to a recent cost analysis, it costs about 2.75 to 5.30 Swiss francs to process 1 cu m of sludge (low degree of oxidation), and 5.80 to 16 Swiss francs for a high degree of oxidation (ash). Thermal drying and incinerating is 50 percent more expensive; aerobic decomposition is 40 percent more expensive. In the ZIMPRO-System, sludge with a content of 4 to 7 percent of dry substances is mixed with compressed air and heated to about 150 to 200 C. In a reaction chamber, whose pressure can be varied between 5 and 200 atm, oxidation takes place. The heat generated can be utilized in a heat exchanger. The gases collected in a separator are scrubbed and, if necessary, passed through a catalytic afterburner. The sludge is filtered and the clear, sterile filtrate is returned to the sewage pool, while the filter cake may be dumped in landfills. (Text-German)

67-0790

Steam cleaning system aids maintenance. Public Works, 98(8):154, Aug. 1967.

The steam cleaning system consisting of one portable unit and one stationary unit at the Metro Renton Sewage Treatment plant in Seattle is described. The major use for the stationary unit has been in removing the grease and grime from pumps and equipment; the safety hazard involved in handling slippery machinery is thereby eliminated; fewer man-hours are required for repair jobs, and less clean-up is necessary after a repair is completed. Steam cleaning is also used in the preparation of metal surfaces for painting and the cleaning of metal surfaces for general housekeeping. It is also used in the preparation of concrete floors and other concrete surfaces for painting or sealing. The steam cleaning of scum hoppers and various other flumes and waste receptacles throughout the plant is done on a regularly scheduled basis. The initial cost of the trailer mounted unit was $11,000 and of the stationary unit, $5,000.

67-0791

Stedronsky, V. L. Methods of collecting lint cotton trash. In Control and Disposal of Cotton-Ginning Wastes; a Symposium, Dallas, May 3-4, 1966. Public Health Service Publication No. 999-AP-31. Cincinnati, U.S. Department of Health, Education, and Welfare. p.45-50.

The problem of collecting and disposing of gin trash falls into two main areas: dealing with the coarse, heavier trash such as burs, sticks, stems, leaves, sand, and dirt; and collecting the finer dust, small leaf particles, and fly lint that are discharged from the lint after the fibers are removed from the seed. Attempts at collecting gin waste by use of settling chambers, screen wire lint cages, and in-line filters are described. Tests have shown that an in-line filter system with 105-mesh screen collected over 99 percent of all fly lint and all foreign matter particles larger than 165 microns, and 70 percent of all particles smaller than 165 microns, resulting in an overall efficiency of 87 percent for the unit. Materials-handling research for conveying seed cotton, cottonseed, and trash is underway. An experimental ginning system, which has only one fan exhausting into the atmosphere, is showing promise.

67-0792

Steytler, R. Savings in activated-sludge systems. American City, 82(5):113-115, 148, May 1967.

Tests on two sewage plants in Gainesville, Florida, showed savings of $1,400,000 by designing the aerators strictly on the basis of lb of BOD to be treated, rather than on a time basis. Both plants treat a weak sewage with BOD and suspended solids about half normal strength. The aeration tanks were sized to contain enough solids by weight at a concentration of 1,500 mg per liter to produce a 1:1 ratio with the pounds of BOD to be treated daily. Aeration time was 1 hour, 24 minutes; and $500,000 were saved by eliminating primary clarifiers and increasing size of aerators. Tests were made to determine the best solids loading and sludge return rates and what portions of the plant should be watched for overloading. The criterion used in defining activated sludge systems is the F:M ratio (food to microorganism). The F:M ratio varied from 0.3 to 1.5 with no appreciable difference in the plant effluent. Difficulty in controlling quantity and quality of the waste and return sludge was noted. The vacuum cleaner tape clarifier used on secondary tanks must be modified if primary tanks are not used. Percentage volatile solids in sludge varied considerably. Activated sludge would bulk in aerators as the mixed liquor ratio approached 300 mg per liter in the aerator. None of the plants have sludge thickening devices. They hope to oxidize odors in the plant influent line. A sudden change in loading rates produces a temporary but substantial effect on the system efficiency.

67-0793

Stoecker, D. L. Furfural waste treatment. Water and Wastes Engineering, 4(6):56-59, June 1967.

Furfuraldehyde, a by-product of the cereal industry, and the wastes resulting from the manufacture of other by-products are the basis of this study. The manufacture of furfural results in a high temperature waste with a very low pH and high BOD. Tests showed that the best means of neutralization was by titration with a calcium carbonate slurry. The slurry was obtained from the water softening process at the municipal water treatment plant. The neutralized waste was combined with the water pollution control plant influent in the ratio 1:90. The heat loss occurred in the walls of the line transferring the waste to the water treatment plant and was considered a benefit. Raw furfural wastes are pumped into a mixing tank. The lime slurry is pumped from the bottom of the water softening basins to two slurry receiving tanks. Gravity flow of the slurry from these tanks to the mixing basins is controlled by an automatic valve, which receives a signal from the pH monitor. The slurry and waste are combined and mixed in a stainless steel mixer. From the mixer, the neutralized waste overflows into the sewer, and the carbon dioxide is vented to the outside atmosphere. A spray system controls the foam buildup. This system has received several pollution control awards. Additional data about this system are contained within the report.

67-0794

Stone, E. H. F. Treatment of non-ferrous metal process waste at Kynoch Works, Birmingham, England. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.848-865.

A redrainage and effluent treatment system costing approximately one-third of a million pounds was installed at Kynoch Works to comply with the stringent regulations of the Rivers (Prevention of Pollution) Act, 1951. Chemical problems affecting the plant design included: neutralization and pH control, reduction of chromate, oil removal, sedimentaion, and sludge disposal. Vacuum filtration was used for the disposal of sludge from the clariflocculator. A handleable filter cake containing 70 percent moisture content is obtained. Materials of construction, civil engineering work, and instrumentation systems are described and illustrated. Typical analyses of treated effluent are given. It was established that, if a wider final pH range of the order of 9.1 to 10 could be tolerated, and variations in acidity and volume of influent could be smoothed out, then two control stages should be adequate. It was possible to run the plant with a throughput of 1.5 MGD using only one clariflocculator. During normal operation using both clariflocculators, daily de-sludging for a period of 4 to 8 hr was adequate to maintain efficient performance and at the same time to provide sludge for the correct consistency for vacuum filtration. A sand filtration plant was installed to meet River Authority conditions.

67-0795

Talty, J. T. Industrial solid waste management. Presented at Rocky Mountain Conference on Air Pollution, Laramie, Wyoming, Nov. 16-17, 1967. 10 p.

Waste materials generated by industries are highly dependent upon the industry group involved. The manufacturing and mining groups are the most significant in terms of solid waste generation. Significant amounts of waste are salvaged and recycled by various industries. The total secondary materials industry is estimated to be a $5 to $7 billion a year operation. The paper industry generates 25 to 30 million tons of waste from paper and paper products on an annual basis. In 1964, some 9 to 10 million tons were salvaged and recycled to the industry. Large quantities of waste material result from the mining of solid fuels, metals, and nonmetallic minerals. All procedures for managing solid waste problems involve the use of one or more of three basic management methods: reduction of waste production; reclamation, utilization, and recycling of waste products; and returning wastes to the environment via land, air, or water. The most challenging and promising field for industrial research and development lies in the area of waste recycling and reuse. Current products of interest to the overall problems of industrial waste management are described. Studies relating to solid wastes generated by the tobacco, demolition, and automotive industries will be performed during the current fiscal year by the Solid Wastes Program. The U.S. Bureau of Mines has a number of active research projects on solid waste problems relating to minerals or fossil fuels.

67-0796

Tesarik, I. Flow in sludge-blanket clarifiers. Journal of the Sanitary Engineering Division, Proceedings, American Society of Civil Engineers, 93(SA6):105-120, Dec. 1967.

A sludge blanket is a fluidized floc bed and behaves in accordance with the general equation of fluidization. The capacity of a clarifier in winter is lower because of the increase in viscosity. Clarifiers can be classified as: mechanically agitated, hydraulically fluidized, sludge circulation, and unsteady discharge. In clarifiers with mechanical agitation, the bed is fluidized by the vortex created behind the sludge-remover rake. This eddy does not separate from the rake because of its low velocity. Flow in a funnel-shaped sludge-blanket chamber is unsteady. In the funnel entry, separate vortices are formed and propagate to the sludge blanket level. However, their influence generally does not reach into the zone of clarified water. The height of clarified water above the sludge-blanket level should not be less than one-half of the horizontal distance between two collecting troughs. The discharge of suspension overflowing into the sludge thickener depends on volume concentration, floc density, and height of the sludge above the weir crest. Relationships are graphed.

67-0797

Treatment and removal of refinery wastes. Wasser und Abwasser, 108(14):380-382, Apr. 1967.

The Manual on Disposal of Refinery Wastes, by the American Petroleum Institute, covers: oil-containing waste waters (volume I), waste gases and fly ash (volume II), chemical waste waters and waste materials (volume III), methods for sampling and analysis of waste waters (volume IV), methods for sampling and analysis of waste gases and fly ash (volume V), and solid waste materials (volume VI). Volume I deals with: the effect of oil on fisheries and recreation, the behavior of oil films, the origin of oil in waste waters, methods for treatment of waste waters, oil water separators, design of oil separators, oil water emulsions and their properties, stabilizers and emulgators, cleaning of tankers, and flow measurements. Volume III deals with: the chemical and physical properties of the chemical waste materials, their origin and toxicity, the effect of chemical waste waters on natural waters, treatment of phenolic waste waters, and chemical and biological treatment of waste waters. (Text-German)

67-0798

Treatment of tomato-processing waste. Water and Waste Treatment, 11(10):453-454, Nov.-Dec. 1967.

In order to improve their waste treatment facilities, Hunt Wesson Foods Canada Ltd., a tomato-processing plant, installed an oxidation ditch incorporating specific equipment. Their season of operation is about 60 days per year, during which time they process a full year's crop of tomatoes and produce about 300,000 U.S. gpd of medium strength industrial waste with a BOD load of about 800 ppm, suspended solids of 300 to 400 ppm, and a pH average of 6.5. Now engaged on processing its first year's waste load, the ditch has a treatment capacity of 425,000 U.S. gpd and provision for an average detention time for the whole waste flow of 1.99 days. Spaced around the ditch are three multi-tooth aerating/propelling rotors which dip into the surface of the wastes and propel them in the direction of flow at a regular speed, introducing oxygen into the liquid and mixing the ditch contents. From the ditch the partially treated effluent flows to a clarifier where the liquid is passed through a peripheral duct formed by a suspended skirt set off-center within the circular tank. The liquid remaining in the duct increases in velocity as it flows around and is then forced down and under the skirt. After a detention period of 3 hr, the clarified liquid from the settling zone is collected and passed over effluent weirs to the drainage ditch. Settled solids are concentrated in a central sump by mechanically driven scrapers before being returned to the oxidation ditch. Analysis of the final effluent has shown a reduction to 38 ppm of suspended solids and an efficiency of 89 percent in BOD reduction; pH of the effluent was neutral. A successful solution to the waste treatment problem was achieved at a total cost of £75,000.

67-0799

Triebel, W., and G. Peil. The processing of sludge at the purification plant of the Niersverband, Germany. Wasser und Abwasser, 108(18):495-506, May 1967.

At the purification plant of the Niersverband, fresh sludge is mixed with activated sludge and the water content is reduced to 92.6 percent. A similar value can be achieved with sludge composed mainly of iron dust when it is passed through seven separators. In two rotting towers the sludge is then subjected to organic decomposition. In subsequent separators about 44 percent of the water is extracted in a process which lasts 2 to 3 days (and costs 0.45 DM per cu m). The sludge from the separators is either transported away (cost: 2.10 DM per cu m) and applied in the wet state as fertilizer, or it is dehydrated in vacuum filters, dried and then sold as fertilizer (cost, after subtracting the proceeds from the sale as fertilizer: 5.86 DM per cu m of liquid sludge). During the vegetation period of the year the wet sludge must be pasteurized (cost: 0.57 DM per cu m). The costs for the sludge decomposition in the rotting towers amount to 0.85 DM per cu m. The use of polymeric additives (cost: 0.12 DM per cu m of sludge) is effective but after dehydration it leaves a water rich in solids. Former methods of processing sludge and various experiments are discussed in detail. (Text-German)

67-0800

Uhthoff, K. Industrial zoning from a hygienic point of view. Staedtehygiene, 18(9):197-200, Sept. 1967.

In order to minimize the detrimental implications of industrial developments for the health and well-being of the population, industrial zoning requires the counsel of hygienists. The location of the new industry depends on: the kind and amount of air pollution to be expected; the noise and odors it will generate; requirements for roads, waterways, and railways; and supply of water, fuel, new material, and electricity. The design and construction of the buildings, especially in the case of food processing industries, slaughterhouses, dairies, etc., must also incorporate hygienic principles. Care must be taken to prevent rats, insects, and other animals from reaching both food and organic wastes. Also, the maintenance of the essential cleanliness for such industries can be facilitated by proper architectural planning. Characteristic features of various types of industries are discussed, and some examples for proper hygienic planning are quoted. (Text-German)

67-0801

Unwin, H. D. In-plant waste water management. Industrial Water Engineering, 4(8):18-21, Aug. 1967.

Reclamation, dilution, treatment at the source, and segregation of wastes should be investigated for waste control. Keeping pickle liquor, waste chromic acid, and alkali wastes separate permits use of the sulfuric acid and iron in the liquor to reduce the toxic chromic acid. Adding chemicals to raw wastes breaks the emulsion and causes the floc to settle. Oil-bearing wastes may be pumped through a pressurization tank ahead of a flotation unit. Removing soluble oil from process waste water results in scum and sludge formations. A three-way solenoid-operated valve is automatically activated to divert the contaminated condensate to the industrial waste collecting system when the pH becomes too high or low. A polishing sedimentation tank, following a flotation system can reduce the ether soluble material in the effluent to an acceptable degree. Liquids can be concentrated by dewatering, and hauled away. Using three rinse tanks following a dip tank conserves water in plating operations.

67-0802

The utilization and elimination of domestic and industrial waste water sludges. Wasser und Abwasser, 108(18):491, May 1967.

The Bavarian Institute for Biological Research came out with a new volume of its series called Muencher Beitraege (Contributions by Munich). The new volume comprises a collection of papers on sludge disposal presented at a meeting in the fall of 1965. Two papers deal with the problem of killing worm eggs. It has been found that the method of sludge mineralization considerably increased the number of worm eggs. The most reliable way to kill them is to pasteurize the sludge. Moreover, the sludge-ash method as well as the 'Carbofloc' method are described in detail. Contributions on rotting tests, on agricultural utilization of sludge and composting as well as on the common treatment of sludge and waste are to be found in the new volume. (Text-German)

67-0803

Vacuum filtration sludge disposal at Newbury Sewage Works. Surveyor and Municipal Engineer, 130(3942):5-7, Dec. 23, 1967.

The vacuum filtration sludge disposal plant installed at Newbury Sewage Works is described. It includes one 10-ft diameter by 10-ft face Komline-Sanderson Coilfilter which has a nominal filtering area of 315 sq ft together with the necessary auxiliary equipment. The installation is designed to handle a mixture of undigested primary and humus sludges from a population of 37,000 with allowance for future incorporation of a second Coilfilter to handle a population of up to 50,000. The mixed sludge is withdrawn from the primary sedimentation tanks and pumped to two sludge consolidation tanks prior to filtration. Adjacent to the Coilfilter building there is a sump which is in hydraulic balance with the consolidation tanks. Sludge is drawn from the sump and delivered to the rotating conditioning tank, where lime and copper are added to condition the sludge prior to filtration. The conditioned sludge flows over a weir at the outlet end of the conditioning tank and then gravitates to the Coilfilter bath. A valved outlet is provided on the sludge feed-line so that the contents of the Coilfilter bath can be drained and discharged to the general drainage system. The Coilfilter drum and its operation are described in detail and a schematic diagram of the vacuum filtration installation is given. Costs of the 1966 to 1967 extensions, which include construction of two sludge consolidation tanks, a vacuum sludge treatment and storage building, an additional circular humus tank; the motorizing of the existing sludge valves on the sedimentation tank control chamber with time-clock control; a stone-trap chamber with air lift at the inlet works; and the duplication of the existing 27-in. outfall sewer are £119,000.

67-0804

Vennes, J. W., and O. O. Olson. BOD and bacterial changes in various wastes during BOD testing. Official Bulletin, North Dakota Water and Sewage Works Conference, 34(7&8):2-5, Jan.-Feb. 1967.

Changes in oxygen demand and bacterial populations in biological oxygen demand bottles with wastes of very high to very low BOD were studied. Daily determinations of these changes were made to discover the 5-day BOD at 20 C (BOD5). Raw sewage, raw protein water (starch waste), aerated lagoon effluent, and cheese waste were the types of wastes investigated. Results indicated that for high BOD wastes the daily changes in BOD are great as are chances for error. With low BOD wastes, time of incubation is not critical. Seed cultures such as river water exhibit stable populations and act as control groups. Included data reveal that cheese waste (BOD5-46,000 mg per liter), with the highest BOD, reaches peak bacterial population in four days, correlating with a slow breakdown of the waste. Conversely, the data show that low BOD wastes reach peak population in but 2 to 3 days. These facts support the conclusions stated.

67-0805

Vickerman, J. L. Treatment and disposal of effluent from a 450 ton per day Kraft pulp and paper mill into classified inland waters. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.968-982.

Effluent from a pulp and paper mill, prior to discharge into an inland waterway classified under New Zealand Water Pollution regulations, is treated by two systems. Effluent containing high SS loadings enters the No. 1 system, flows through a primary clarifier and passes down a stepped aeration structure to join a dry water course. System No. 2 receives pulp and bleach plant wastes which contain the higher concentrations of color and BOD. Before the effluent reaches the seepage ponds it passes through an elementary primary sedimentation unit which removes 60 to 70 percent of suspended matter. The system comprises 126 acres of soak ponds operating normally at depths of 2 to 6 ft. The topography and soil are suited to a good volume of seepage disposal. The residual BOD of the stored effluent due for discharge (92,000 lb per day), becomes greatly reduced before joining the No. 1 system flow as a result of aeration during passage down a stream. A summary of the costs of establishment and operation of the systems is given.

67-0806

Warner, D. L. Deep wells for industrial waste injection in the United States; Summary of data. Water Pollution Control Research Series Publication No. WP-20-10. Cincinnati, U.S. Department of the Interior, November 1967. 45 p.

One hundred and ten industrial waste injection wells located in 16 states are described. Table I and Figure I summarize the contained information. The table shows that about 82 percent of the wells are used by chemical, petrochemical, and pharmaceutical product plants; refineries and natural gas plants; and metal product plants. Figure I shows the number of injection wells placed in operation during each year from January 1950 to January 1967. The increase in rate of construction of these wells can be attributed to more emphasis on water pollution control and the widespread acceptance of this disposal method that has accompanied its successful use. The existing injection systems in the United States are heavily concentrated in the north-central and Gulf Coast areas, as a result of favorable subsurface geology, heavy industrial concentration and other factors. Much data are presented regarding the well depth, the chemical and physical character of the waste, and injection rate and pressure, etc.

67-0807

Waste treatment has gone continuous for Xerox. Chemical Engineering, 74(2):98, Jan. 16, 1967.

A continuous system, replacing batch storage and treatment, has modernized waste treatment techniques at the Xerox plant in Webster, New York. Wastes produced by painting, cleaning, and plating are stripped of cyanide and chromium contaminants; the resulting effluent becomes comparable to good lake water. The process sequence consists of chemically treating the wastes in continuous-flow tanks, adjusting the pH, and then filtering out the solids. Cyanide wastes, for example, are treated with chlorine in a two-step process forming cyanates and other innocuous compounds containing carbon or nitrogen. Chromate wastes are treated with sulfur dioxide; two pressurized filters are used alternatively, and the flow rate of wastes can be regulated. Accumulated sludge is removed by pulling the filter assembly out of its housing, letting the sludge dry partially, and shaking it off the filters into carts. Xerox is now studying the feasibility of recycling the effluent now fed to a local waste treatment plant.

67-0808

Waste treatment plant adds capacity. Public Works, 98(9):112-113, Sept. 1967.

The waste treatment facilities of the Salt Creek Drainage District in Illinois, with a contributing population of about 25,000, and with average waste flows of about 2.8 mgd, are described. The present facilities are designed for a flow of 3.5 mgd and a population of 35,000. Presently under construction are two raw sewage preaeration tanks, 24 by 110 by 15 ft each, and final effluent chlorination facilities. When operative, the two tanks should result in a substantial BOD reduction through the primary settling tanks. Future plans include conversion of the preaeration tanks to aeration tanks when the activated sludge process treatment is incorporated with the trickling filter plant; contact stabilization is an alternative, either preceding or following the filters. The chlorination facilities being added will allow application of 15 mg per liter chlorine solution to the final settling tanks, which will temporarily serve as chlorine contact basins. The district has plans to construct two new final settling tanks, at which time the present settling tanks will be converted to permanent chlorine contact basins.

Industrial Wastes

67-0809

Watson, K. S., R. P. Farrell, and J. S. Anderson. The contribution from the individual home to the sewer system. Journal of the Water Pollution Control Federation, 39(12):2039-2054, Dec. 1967.

The characteristics of home waste water with and without the use of appliances were studied. Results are based on three home sampling stations whose equipment, which includes a disposer, wet wall, sampler, refrigerator, control panel, and strip chart recorder, was specially designed and built to meet the requirements of the study. Details of operation are described and illustrated. Three test homes were selected for study based on key factors such as location, family size, appliance usage, and type of waste water disposal system used. The waste water data from the test homes included several hundred analyses of daily composites over long periods of time. It was found that concentrations in the typical, most often run parameters of BOD, COD, and solids, and in the less often run parameters of nitrogen, detergents, and phosphates, vary widely in the effluent from an individual home. In the at-source analyses, higher concentrations than those previously reported in literature were found for oxygen demand determinations, solids values, total phosphate, and nitrogen. In an evaluation of the load contributed to the sewer system, no significant increase was found in the use of water as a result of disposer use. However, there was an average per capita load increase in the waste water of 26 percent suspended solids, 17 percent BOD, and 35 percent grease, with results showing wide variation in characteristics from home to home. The study demonstrates that where detailed information is desired on home waste water, an accurate composite sampler can be designed, installed and operated.

67-0810

Westberg, N. A study of the activated sludge process as a bacterial growth process. Water Research, 1(11/12):795-804, Nov.-Dec. 1967.

A model of an activated sludge process, inoculated with bacteria, is described and illustrated by means of a flow diagram. The process is studied under steady-state conditions and complete mixing. The three operational parameters which seem to be particularly useful are: the flow factor, the nominal retention time, and the sludge age. The fundamental problem is to represent the process variables as functions of the parameters. The three process variables are: the concentration of substrate, the concentration of living bacteria, and the concentration of dead bacteria in the reactor. In order to establish the desired relations, four biological constants were introduced: the growth rate, the death rate, the dissolving rate, and the yield. Using a balanced equation, three relations are deduced by determining the three variables as functions of the operational parameters. According to the formula, the concentration of the substrate in the outlet is independent of the concentration in the feed. The results of other calculations are tabulated and illustrated graphically: ultimate BOD (mg per liter); efficiency (%); biological, inert, and solid suspended solids in reactor (mg per liter); biological and total excess sludge per cu m of feed (g); biological phosphorus removal; oxygen consumption per cu m feed (g); and efficiency and oxygen consumption as functions of the concentration of total solids.

67-0811

Wheatland, A. B. The treatment of effluents from the milk industry. Chemistry and Industry, 36(36):1547-51, Sept. 16, 1967.

Pollution by waste water from the dairy industry depends both on the volume of waste and on the organic content (milk solids present) so that the reduction of the volume and strength of the effluent is important in determining the necessary cost of treatment before discharge to surface waters. Effluents come from milk reception depots and bottling plants, but most come from plants producing butter, cheese, evaporated milk, sweetened condensed milk, and milk powder. While deliberate wastage of surplus material such as whey and skimmed milk may be unavoidable, these liquids should never be discharged to drains. If they cannot be evaporated or used for animal feed they should be removed by tanker for discharge where there will be no nuisance. The limit of dairy effluent discharge to streams of a 5-day BOD is 20 mg per liter while the washings from butter and cheese show a BOD of 3,000 mg per liter. This emphasizes the high degree of purification required of the treating plant involving settlement, biological treatment with activated sludge, and filtration. Tables are given which show the 5-day BOD in an experimental alternating double filtration plant and from four operating plants. A flow sheet is given of a contact-stabilization activated sludge process which is used for treating waste water from the production of waste and sweetened milk by aeration and mixture with domestic sewage. A table is given which shows the performance of granite and plastic medium for partial treatment of dairy wastes.

67-0812

Wierzbicki, J. River water pollution and the utilization of sewage in USSR agriculture. Gospodarka Wodna, 27(10):374-375, Oct. 1967.

USSR rivers alone will not be able to dilute industrial waste and city sewage by 1980 if the present rate of urbanization and industrial development is maintained. A projected 1980 total sewage volume is put at 157 billion cu m, of which 42 percent will be industrial waste. Increased arable land should absorb 47 percent of the total, with the remaining 53 percent to be treated in biological treatment plants. Table 1 shows estimated 1980 frequency of dilution by surface waters in a dry year for various USSR economic regions. E. Alekseyevski, Minister of Water Economy and Land Improvement, advocates an intensified use of waste in land improvement. Only 9,000 ha were irrigated by waste waters 15 years ago. This area increased to 41,000 ha by 1967, and several hundred thousand ha more are scheduled to be added in the near future. At least 15 to 20 arable ha in the suburbs should be treated with sewage for every 1,000 of city population. A series of tests were run in the northern area near Pushkino during 1963 to 1966, in order to study the filtration factor in frozen soils. Results indicated that waste filtered through 0.7 to 1.2 m of frozen soil to the drains. Best results were obtained on light soils. A Central Scientific Research Station in Kupavna, operating near Moscow since 1957, took bacterial counts from below 20, 40, and 60 cm of sandy-clay soil. Counts were made 1 month after the frozen soil was treated with 1,000 and 3,000 cu m per ha of city sewage which contained 250 mg oxygen per liter. Reduction of bacterial counts in Table II suggests that moderate applications of sewage are preferable. (Text-Polish)

67-0813

Willenbrink, R. V. Waste control and treatment by a corn soybean processor. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.517-525.

The waste treatment system of a Decatur, Illinois, producer of corn starches, syrups, dextrins, dextrosehydrate, chemicals, and feed products consists of an activated sludge plant. The system originally consisted of one aeration basin and a clarifier which was a Dorr thickener. The aeration basin was divided into a sludge reaeration section and aeration section. Later a second aeration-reaeration basin was added and another Dorr thickener was put into operation as a surge basin for handling filtrates. Still later the surge basin was converted to an aeration-reaeration basin. A comprehensive study was made covering all process equipment operation which might contribute to a sewer loss. A pre-treatment system was installed to remove traces of volatile chemical by-products by aeration. Three nozzle centrifuges were installed to eliminate excess sludge loss to the sewer. The clarifier rake mechanism is being replaced by a suction type unit to facilitate uniform sludge removal and further reduce clarifier retention time. Nutritional demand by the bacteria was satisfied by the use of a soluble protein process stream. Maximum BOD removal rates occured at loadings (lb BOD per lb MLSS) between 1.0 and 1.75. The two phases of the sewer loss reduction program, monitoring and waste treatment, resulted in an overall loss reduction of 50,000 PE per operating day.

67-0814

Woernle, R. Elimination of industrial wastes. Chemie-Ingenieur-Technik, 39(11):684-686, June 1967.

At a VGT/Dechema (German Chemical Association) meeting in Stuttgart, West Germany, on November 25, 1966, six papers were presented. The first dealt with the incineration of liquid and pulverized material. For thorough incineration these materials are mixed with easily-combustible additives such as oil or gas and burned in a rotating drum furnace. In a second paper, a report was given on the waste problem in the Farbweke

Hoechst. A monthly accumulation of 8,300 tons of combustible waste, composed of paper, packing material, wood, cardboard barrels, solvents, and sludges was noted. Also, each month 700 tons of solvents are burned in a shaft furnace. Chlorinated products are burned in controlled amounts. No corrosion occurred after 8,000 operating hours. In a paper on the elimination of toxic residues in herbicide production, it was stated that toxic material can be neutralized by adding lime and subsequently chlorinating. In a fourth paper the Passavant sludge/ash method was reviewed. With this method the sludge is first dehydrated so that combustible cakes may be formed; these cakes are then dried and incinerated. Corrosion was noted in several places on a waste incinerator at the Badischen Anilin and Soda Fabrik. It was found to be most evident in the combustion chamber. The last paper reviewed the incineration of chlorine-containing waste and the resultant corrosion. (Text-German)

67-0815

Woernle, R. Elimination of industrial wastes. Chemie-Ingenieur-Technik, 39(15):927-928, Aug. 1967.

A meeting of the VGT/Dechema Association was held in Stuttgart on March 17, 1967. Six papers were presented. The first paper reviewed the incineration of heterogeneous waste material from the chemical industry. A second paper dealt with the emission of solids and gases from medium-sized incinerator plants. The discontinuous combustion process is typical for this type of incinerator. It makes the thorough incineration of waste gases very difficult. Moist waste lowers the waste gas temperature; waste gases with a disagreeable odor arise, and these have to be destroyed in an afterburner. Two papers reviewed the various possibilities for cleaning the flue gas escaping from waste incinerators. The last paper discussed the flame chamber method for incinerating household and industrial wastes, plastic material, and oil residues. In the flame chamber the continuously added waste forms a wall which melts on the side which faces the flame. This melted layer acts like a filter. Behind this melted layer the drying and evaporating process takes place. The rising gas passes the melted layer and is burned in the flame chamber. The melted layer itself slowly but continuously drips into a granulator. An afterburner is used with extremely heterogenous waste. (Text-German)

67-0816

Wood chip flow regulator prevents blockages. Waste Trade World, 110(10):14, Mar. 11, 1967.

A Vibra screw bin activator has been installed by Simon Handling Engineers Ltd., in the plant of F. Hills and Sons Ltd., Stockton-on-Tees, to allow the regular feeding of wood chips from the bottom of a storage hopper. Wood chips have a bulk density of 10 to 12 lb per cu ft, and a moisture content of up to 20 percent, and it is the moisture content coupled with the size of the chips which normally induces blockages during the outflow action. The bin activator regulates a constant flow of the chips, which are used for the production of chipboard, into a horizontal screw feeder at a flow rate of 1 ton per hr.

67-0817

Young, W. M. Activated sludge disposal by spray irrigation. Surveyor and Municipal Engineer, 129(3904):19-20, Apr. 1, 1967.

The solution to the problem of bulking of activated sludge which caused serious disposal problems is described. In Uppingham, England (population 3,300) the problems which occurred from the bulking of activated sludge in a plant treating purely domestic sewage were corrected by the use of spray irrigation equipment which spreads the surplus activated sludge directly on the land. The public health risks were considered and appeared to be slight. It was considered inadvisable to spray salad vegetables with liquid sludge or to allow grazing by animals for human consumption for several months after spraying pasturage. Spraying in Uppingham takes place only on fallow land with 3 acres reserved for this use. It is used 1 acre at a time and then cropped. A Model 25 'Raingun' can spray 3,000 gal an hour and can be operated unattended.

67-0818

Zandi, I. Decreased head losses in raw-water conduits. Journal of the American Water Works Association, 58(2):213-225, Feb. 1967.

This article's purpose is to bring to the attention of engineers in the water industries the potential head loss suppressing action of suspended matter, and also to present some new two-phase (Solid-water) systems data. The testing apparatus consisted of five horizontal, galvanized test pipes, each 55 ft long, with diameters of ½, ¾, 1, 1½, and 2 in. All pipes were connected to two manifolds and to these were put two sets of pump-storage combinations. The liquid could be pumped directly from one storage tank to another through the test pipes while observations are being made. Four types of solid particles were selected for the study; and head losses were measured for numerous combinations of different pipe diameters, concentration of solids, and mean velocities. Approximately 800 data points were collected and almost all fall below corresponding points for clear water. For the 1-,1½-, and 2-in. pipes, clay caused the most reduction, whereas in ½- and ¾-in. pipes, charcoal had the greatest effect. Attempts to establish a systematic diameter, concentration, or specific gravity effect were not successful. Several possible uses are suggested for the process, one being the improvement of sedimentation processes in treatment plants. Also the removal of odor and taste with activated charcoal powder is indicated.

67-0819

Zimpel, J. Waste water elimination. VDI [Verein Deutscher Ingenieure] Zeitschrift, 109(14):656-659, May 1967.

After a discussion of the steps taken by the West German Federal and State governments to clean polluted water, the aerobic and anaerobic treatment of sludge is briefly described; 14 papers dealing with this subject are cited. Small purification plants in which the sludge can be treated aerobically are very well suited for municipalities with a population of up to 5,000, but measures are being taken to construct such plants for larger municipalities. In Nordhorn (population 40,000), West Germany, the first large plant has been put in operation. Here, the purification of the waste water is performed separately from the aerobic sludge stabilization. The three possibilities for arranging buildings with this method are illustrated. The question of whether the sludge stabilization in larger purification plants shall be aerobic or anaerobic has not yet been settled. If enough sewer gas is obtained in the anaerobic rotting process, the question will be decided in favor of the anaerobic method because the entire power and heat requirement can be covered by utilizing the by-product. (Text-German)

67-0820

Zobel, D., and F. Matthes. Methods for eliminating phosphorus sludge. Chemische Technik, 19(12):762-765, Dec. 1967.

Well-known methods of phosphorus sludge treatment are reviewed, including the incineration of phosphorus sludge, the distillation of sludge water, and the reduction of sludge viscosity in order to pump it to a burner. The limitations of the various methods are discussed. The high degree of dispersion of yellow phosphorus in the sludge and the extremely high stability of this emulsion indicate that an alkaline treatment of phosphorus sludge is feasible. Experiments using this new method were developed. The phosphorus sludge was neutralized with a stoichiometric amount of NaOH which converted the yellow phosphorus in the sludge into a solution containing hypophosphite and orthophosphite, and into a mixture of phosphine, hydrogen phosphide, and hydrogen. By filtering and crystallizing the solution, an extremely pure orthophosphite mono-H was obtained. (Text-German)

HAZARDOUS WASTES

67-0821

Agricultural Research Service. Disposing of empty containers and unwanted pesticides. *In* Safe use of agricultural and household pesticides. Washington, U.S. Department of Agriculture, Jan. 1967. p.2-3.

Waste pesticides should be placed in pits which have been dug in level sandy soil; the pits should be so located that their contents would be unable to contaminate any water supply. The empty pesticide containers should then be rinsed with water and disposed of in one of several ways. (1) Large metal drums should be returned to the supplier; sold to a firm which deals in used drums and is equipped to detoxify them; taken to a sanitary landfill which is prepared to receive them, and, before being dumped, have their lids punctured; or taken to a private disposal site which is used only for waste pesticides and pesticide containers. (2) Small metal containers should be taken to a public dump or be privately buried at a depth of at least 18 in. (3) All combustible containers, with the exception of herbicide containers, should be burned. (4) Glass herbicide containers should be broken and non-glass herbicide containers should be punctured on all sides. They should then be buried in a safe disposal site at a depth of at least 18 in. Unwanted pesticides should never be incinerated, and empty drums and barrels should not be converted into livestock feed troughs, water storage tanks, or raft floats. If used in these ways, the empty containers could be sources of feed or water contamination.

67-0822

Atomic waste. Refuse Removal Journal, 10(8):32, Aug. 1967.

Western Europe is looking for a place to dump its atomic waste. It may end up in the Atlantic Ocean. A refuse ship would collect the sealed and protected wastes from European ports in France, Germany, Holland, Belgium, and Britain. Studies are being undertaken in the British ports of Newhaven, Plymouth, Portsmouth, and Southampton to determine which port is best equipped for transferring British nuclear waste to the ship.

67-0823

Baines, N. D. Progress in the disposal of solid radioactive waste. Public Cleansing, 57(9):473-479, Sept. 1967.

At a conference on Public Cleansing, the control of radioactive waste disposal was discussed and the experiences of some municipalities with radioactive waste disposal were described. It was stressed that this control must ensure that the amounts disposed of and the methods used prevent any appreciable exposure of persons to radiation, both external and internal. To organize control on a national basis, the Radioactive Substance Act of 1960 was passed. This Act requires the registration of persons who keep and use radioactive material, and prohibits the accumulation and disposal of radioactive waste, except in accordance with an authorization from the Minister of Housing and Local Government. The methods of disposal recommended for materials with different levels of radioactivity are briefly indicated.

67-0824

Baker, G. H. Pesticide residues and toxicity in foods. Public Health Inspector, 75(5):237-240, Feb. 1967.

Micro-residues of chlorinated hydro-carbons and organo-phosphorous compounds have been present recently in river water, worms, slugs, birds, the human diet, and body fat. Pesticides enter the body by absorption through the skin and respiratory tract and ingestion of food containing such residues. Principal pesticides are insecticides, fungicides, herbicides, and seed dressings. There are four methods of pesticide residue analysis: biological, based on a time-mortality of test organisms; chemical analysis for characteristic elements; chromatographic methods for identification and measurement; and infra-red spectroscopy which can be used as a quantitative method of analysis. DDT was found stored in body fat of animals or in organs rich in fatty substances. Dieldrin, five times as toxic as DDT, strikes quickly at the nervous system, sending victims into convulsions. Aldrin and endrin are more toxic. The organo-phosphorus pesticides destroy enzymes performing necessary body functions. A table lists the tolerances for some pesticides in the United States. British associations are planning a sampling and testing scheme for pesticide residues.

67-0825

Blanco, R. E., J. O. Blomeke, and J. T. Roberts. Solving the waste disposal problem. Nucleonics, 25(2):58-61, 68, Feb. 1967.

Immobilizing fission products in solid form within the earth appears to be the most effective means of dealing with the problem of treatment and disposal of dangerous radioactive wastes from the nuclear power industry. Methods of pot calcination, radiant heat spray calcination, and a phosphate-glass process are now being tested at a high level of radioactivity along with specific disposal programs for practicality and economic feasability in line with this reasoning. Land formations with massive salt deposits or other geologic sites permanently excluding water seem to make the best disposing grounds. Tanks have been employed so far for high-level liquid wastes, but the possibility of rupture and need for constant surveillance warrant investigation into other areas such as the conversion of liquid wastes to solids and subsequent dry environment storage (this process is explained in detail in diagrams). Universal applicability, low cost, low mobility, low surveillance, low solubility, and safer heat removal represent plus factors for this method. Tables of the projected increased wastes management problem relative to expanding U.S. nuclear power predict no major refuse problems with the conversion-to-solids concept. Two potential problems do exist: (1) the change in the nature of wastes as a result of new fuel processing techniques; and (2) the proposed practice of releasing Kr85 from H3. Solutions such as the establishment of internal recycles and nonaqueous processes for fuel recovery are presently being developed.

67-0826

Breidenbach, A. W., C. G. Gunnerson, F. K. Kawahara, et al. Chlorinated hydrocarbon pesticides in major river basins, 1957-1965. Public Health Reports, 82(2):139-156, Feb. 1967.

The occurrence of pesticides in carbon adsorption method (CAM) samples taken during 1957 to 1965 is reported in data. The more recent CAM system passes water over a cartridge containing fine carbon at 100 milliliters per minute. The sample volume is 1,000 liters. The carbon chloroform extracts were subjected to a silica gel column cleanup. Lower limits of sensitivity of 0.001 micrograms per liter were provided for the pesticides. One-quart grab samples were extracted with a hexanebenzene mixture and subjected to thin layer chromatography. The results of CAM and grab sampling gave similar results for dieldrin, endrin, DDT, DDE, and DDD. Dieldrin has been the dominant pesticide throughout the period of record. Bar graphs support the observations. Endrin was the major cause of the 1963-1964 fishkill on the Mississippi River. Concentrations of endrin have shown a general decrease since spring, 1964.

67-0827

Deviny, W. M. Disposal of hazardous chemicals. Chemical Engineering Progress, 63(11):56-57, Nov. 1967.

The disposal of hazardous chemicals on a pilot plant scale is discussed. The short duration of process development work or the small amount of chemicals handled make it uneconomical to install in pilot plants the elaborate waste disposal systems designed for commercial plants. Each pilot plant is left with the development of its own solution to the problem, and the method of disposal will vary not only with the chemicals involved but with the location of the plant. The methods investigated for use at FMC Corporation's Baltimore pilot plant are reviewed. Recovery and reuse is an ideal solution although it is invariably uneconomical and may be dangerous. Venting to the atmosphere or running the material down the sewer is the easiest method although it is usually the least desirable from a noxious or a toxic standpoint. At the Baltimore location burning is not desirable because of the large quantities of flammables in the area and the corrosive nature of most of the materials handled, nor is burying practical because of the high water table. Drumming up the material and storing it overlooks the fact that many materials become very unstable on storage. Chemical reaction is usually the least attractive method initially, but in many cases it is the only safe disposal method. It may involve simple scrubbing of the off-gas with dilute caustic, or it may involve an elaborate series of closely controlled reactions.

67-0828

Disposal areas must remain undisturbed for life of nuclear materials. Refuse Removal Journal, 10(12):30-31, Dec. 1967.

The disposal of nuclear wastes, as described in a booklet by C.A. Fox called 'Radioactive Wastes,' is reviewed. Solid refuse with nuclear contamination results from several operations: mining, ore-refining, nuclear feed-material plants, laboratory activities, and reactor installations. Disposal has utilized land and sea burial. Land burial has been used for about two-thirds of all solid waste produced in America at five atomic energy reservations, or for about 40,000 to 60,000 cu yd per year. Wastes are generally buried in pits and trenches, thus permitting the earth coverings to reduce surface radiation levels. Higher activity solids are often buried in concrete-lined wells or stored prior to disposal in order to permit nuclear decay to lower radiation levels. Sea burial at designated locations has been used since 1946 at sites off the continental shelves where the water is more than 6,000 ft deep. For sea burial, wastes must be solidified and compactly packaged in containers which are made of concrete. Thus shipment for sea burial is 3 to 4 times as costly as shipment of baled wastes for land burial. The largest quantitites of radioactive wastes are the products of fission produced during and after irradiation of reactor fuels. The processing and disposal of these wastes is now beginning to be done by private industry, with the application of new techniques for storage of these high-level radioactive materials. The disadvantages of tank storage have led to two general approaches: converting liquid wastes to solid form, and storing these solids deep in geologic formations.

67-0829

First, M. W., P. Zilles, and J. Walkey. Disposal of low level radioactive waste in commercial incinerators. In Ninth AEC Air Cleaning Conference, Springfield, Va., Jan. 1967. Washington, U.S. Government Printing Office, 1967. p.570-594. (Conf-660904.)

A great deal of the contaminated solid waste originating from the use of low levels of radioactive material is combustible in nature. It is not practical to dispose of septic, radioactive, pyrophoric, and poisonous wastes through usual channels. A comparison was made of the performance of a crematory-type incinerator and a combustion of difficult laboratory and hospital wastes such as animals and cage litter. Because of excessive stack emissions of smoke, fly ash, and malodorous gases and vapors, the crematory-type proved unsatisfactory. Under the most favorable operating conditions for avoidance of air pollution and for production of a good quality residue, burning capacity was only 2 to 3 lb per sq ft per hr. Higher burning rates produced severe nuisances. The mechanized steam-boiler incinerator provided a sanitary method for handling and burning such wastes in an efficient and rapid manner. The enormous heat flux inside the combustion chamber of a base-loaded boiler assures optimum conditions for incineration at all times. A cyclone dust collector proved superfluous for use with gas or oil fuels, and it was found that it could be eliminated without decreasing the overall collection efficiency of an electrostatic precipitator which served as a final cleaning stage.

67-0830

Gotte, H., and J. Talsky. The treatment and disposal of radioactive wastes in an industrial laboratory plant. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.405-516.

Radioactive wastes of a German chemical company include: gaseous wastes such as waste air from fume hoods and glove boxes; waste water from research and production; and solid wastes such as contaminated equipment, laboratory wastes, air inlet and outlet filters, decontamination slurries from clarification of the waste water, and animal cadavers. Radioactive laboratory solid waste is taken to the storehouse in polyethylene-lined fiberboard drums. Contaminated cadavers of animals are burnt in a heating plant of the main factory. Material contaminated with short-lived radionuclides is stored until the radioactivity has decayed and then it is disposed of like any inactive waste. Long-lived radioactive waste is reduced to about one-sixth of its volume by means of a hydraulic press and is put into polyethylene bags and stored in closed steel drums. The treatment of radioactive wastes is not only viewed from the aspect of its aggregation, but the chemical constitution of the radionuclides formed and their chemical behavior are also considered. The decision as to whether long-life radionuclides should be diluted or concentrated and then stored depends largely on the maximum concentrations permitted for the discharged waste water concerned, and thus on the radiation emitted by the respective radionuclides and their radiotoxicity.

67-0831

Illinois sets up atomic landfill. Refuse Removal Journal, 10(2):37, 1967.

All material in the first dumping ground for low level radioactive wastes in Illinois will be covered by 4 ft of earth. To monitor the radiation level, the company has drilled five wells and the State will take regular readings of the water.

67-0832

Irving, G. W. The pesticide outlook. Agricultural Chemicals, 22(12):12-15, 1967.

In a general discussion of pesticides, the safe and effective disposal of large quantities of chemical containers and chemical wastes is considered. The Department of Agriculture has just awarded a 3-year grant to Mississippi State University to develop basic principles for disposal of chemical containers and wastes. The project will: (1) determine the combustion temperature and volatile products of selected herbicides; (2) investigate the use of chemicals and other materials to help decompose pesticides and containers; (3) study the use of indigenous soil microorganisms to help decompose pesticides in the soil; (4) check the requirements for pesticide containers that can be readily combustible; and (5) work out specifications for the design, construction, and evaluation of an incinerator for use primarily on farms. USDA is also looking into the possibility of designing a low-cost incinerator that could be used by farmers. The work on disposal of chemical wastes will provide guidelines in handling serious problems in developing plants and in strengthening label requirements.

67-0833

Mawson, C. A. Management of radioactive wastes. In Proceedings; 22nd Industrial Waste Conference, Lafayette, Ind., May 2-4, 1967. Purdue University Engineering Extension Series No. 129. p.5-11.

Experiments carried out at the Chalk River Nuclear Laboratories in Ontario, Canada on the disposal of radioactive wastes are described. An early experiment to develop a method for fixation of wastes into glass is briefly summarized. Two experimental disposals were made to determine how rapidly fission products dissolved in nitric acid would move through the soil to the river. In 1954, 1,500 gal of waste were pumped into a pit containing crushed limestone and lime, and the following year 11,000 gal were put into a pit without a neutralizing medium. The subsurface movements of ‘tracks’ of the fission products were carefully followed by sampling of soil and ground water. Toxic strontium and cesium were greatly retarded by absorption in the soil. After 9 years, the tip of the tongue of Sr-90 from the 1954 disposal was 380 ft from the disposal pit and the limit of movement of the Cs-137 was at 275 ft. Another disposal occurred as the result of an accident at a fission product waste concentration plant. Detailed investigation of local hydrology and chemistry of the soil indicated that Sr-90 migration would emerge in the surface water in 30 years. The critical question in the safety field for nuclear power stations is what would happen if there were a major accident involving liberation of fission products from the fuel. In calculating the maximum permissible discharge of radionuclides into public waters or into the air, the significant figure is the amount discharged in unit time not the concentration.

PACKAGING WASTES

67-0834

Bainbridge, R. W. Physical and molded characteristics of phenolic compounds. SPE [Society of Plastics Engineers] Technical Papers, 13:575, May 15-18, 1967.

The new concept of molding thermosets is discussed. A considerable amount of data has been published on mold design as regards runner and gate size, molding problems, physical and electrical characteristics, shrinkage, etc., when the conventional method of transfer molding is employed. Since such data are not available on the reciprocating screw transfer molding method, and since the physical strength values of phenolic molding compounds vary greatly with the method of molding, tests were set up, using a group of 25 Durez phenolic molding compounds. Molds used were ASTM test specimens. The methods and conditions employed were: compression and conventional transfer molding; and reciprocating screw transfer molding, using Stokes and Rodgers presses and the 'injection molding of thermosets' procedure. The mold temperature used was 340 F as specified by ASTM. Comparative data were collected on mold temperatures of 360 to 370 F. Preheat temperature was the maximum for each type of material. Data currently being collected will consist of types of materials, method of molding, and its effect on shrinkage, transfer pressure, specific gravity or density, tensile strength, flexural strength, impact strength, and electrical strength.

67-0835

Briber, A. A. Are fire tests of plastics meaningful? SPE [Society of Plastics Engineers] Technical Papers, 13:1041-1045, May 15-18, 1967.

Pending a possible change in the New York Building Code from a 'materials' specification to a 'performance' specification, the role of fire tests in the establishment of performance standards for plastic building materials is considered. One large-scale method, known variously as the tunnel test, ASTM E84, UL723, NFPA No. 255, or ASA A2.5 was developed at Underwriters' Laboratories, Inc., by A. J. Steiner and his associates. It determined three variables which are interrelated in the consideration of surface flammability: flame spread, fuel contribution to flame spread, and smoke development. These variables are discussed in some detail. The performance of plastics in the Steiner tunnel varies with physical and chemical properties; structure, thickness, density, hardness, structural makeup, contour, additives, and presence of adhesives or paints are mentioned. Other large-scale fire tests and test methods are discussed: roofing tests, tests of structural assemblies, test requirements for walls and partitions, and tests of fire doors. The performance of plastics in all these tests is briefly highlighted and the concept of noncombustibility is discussed. For fire tests of materials to become more meaningful, the results obtained from separate, large-scale tests must be correlated and interpreted correctly.

67-0836

Conway, M. A., R. J. Gabler, and D. E. Jackson. Flame spread ratings of rigid polyurethane foams by a modified tunnel furnace. SPE [Society of Plastics Engineers] Technical Papers, 13:1046-1051, May 15-18, 1967.

A recognized method of measuring the combustibility of building material, which is appropriate to cellular plastics, defines the surface flammability of a material according to the performance of a specimen 20 in. in width installed as the ceiling of a 25-ft tunnel. The rate at which the specimen burns is compared to that of red oak flooring and asbestos millboard. In an effort to develop a faster and more economical, yet uniformly severe, method of measuring the flame spread of rigid polyurethane foams, an 8-ft fire test tunnel was built with the objective of qualifying it for use with rigid foams containing phosphorus and/or halogen compounds to retard burning. In addition to thermocouples for the measurement of flame spread, the tunnel was equipped with a photoelectric cell and meter to measure smoke. A description of the tunnel as originally built is given with illustrations. Since initial tests indicated that the tunnel was not measuring surface flammability, several modifications were made, including the replacement of the T-shaped main burner with one in the form of a cross with a long 'stem' running the length of the fire box. A long series of tests on asbestos and oak specimens with carefully recorded measurements of plate and specimen temperatures established a procedure which gave reproducible burning rates for foams of similar chemistry and thermal history. The procedure, usually carried out by one operator, is described in detail with accompanying figures. Red oak specimens, used as controls, burned as prescribed within 19 plus or minus 1 minutes at a plate temperature of 695 to 700 F. A run of five conditioned foam specimens gave an average Flame Spread Index of 4,700 with a range of 3,600 to 5,300 and a run of six unconditioned specimens gave an average Index of 4,300 with a range of 3,400 to 4,700. However, when several experimental foams were tested both in the 8-ft fire tunnel and in a standard 25-ft tunnel, there was no significant correlation between the two sets of data and no smoke data were obtained. The failure of one of the experimental foams to ignite was discussed.

67-0837

Frozen foods. American City, 82(6):47, June 1967.

Garbage disposals have decreased the quantity of garbage disposed as refuse in the last 10 years from 0.56 lb per capita a day to 0.39 lb per capita a day. However, advances in food packaging have increased the quantity of combustible rubbish produced.

67-0838

Glass group studies disposal of its packaging materials. Refuse Removal Journal, 10(11):28, Nov. 1967.

An industry-wide attack on one of the nation's growing solid waste disposal problems has been launched by the Glass Container Manufacturers Institute. Mr. J. H. Abrahams, Jr., has been appointed manager of the new control program to help find a solution to the ultimate disposition of glass products once they have served their useful life cycle. It is estimated that glass accounts for about 6 percent of the 4.5 million lb of solid waste discarded daily by the nation.

67-0839

Glass in refuse. Public Cleansing, 57(3):117-125, Mar. 1967.

Because of our changing times, packages and containers must also change. It is the obligation of the manufacturers to let the public see what they are buying; therefore, decorative labels, clear glass containers and bottles, and plastic materials must be used. However, refuse collection consists of all household refuse and varies in characteristics from town to town. The general figures show that packaging materials only take third place in volume, while cardboard takes up the most space in the dustbin, with glass a long way behind. Today's refuse is 9 percent glass consisting of 1,900 million beverage bottles, 975 million food jars and 1,600 million small glass containers. The glass industry has one device that will pulverize glass electrically and another which can be used in the home. Glass may be disposed of in three ways. In controlled dumping, glass is only detrimental to tires, and either the tire industry will design a new tire or tracked vehicles can be used. Although glass content is not altered during incineration, it is useful for two reasons: It loosens mass for easy combustion and it improves the quality of the cinders. Glass can also be used in composting material if it is first pulverized in the hammermill. Sintered glass is used as a carrier of trace-elements for the permanent fertilization of poor, neglected soils.

67-0840

How to dispose of disposables. Chemical Week, 101(11):32-33, Sept. 1967.

Throw-away wrappers, boxes, and bottles which have revolutionized packaging have created a problem of disposing of the disposables. With the volume of solid wastes increasing faster than the population at a time when dumping grounds become scarcer, and limitations go into effect on burning, burying, and offshore dumping of used packaging materials, it is evident that convenience packaging has become problem packaging. About 50 billion food and beverage cans are thrown away annually. Some 250 cans, 135 bottles and jars, and 338 plastic and metal caps per person are thrown away each year. Dow is experimenting on 'go away' bottles which are self-destroying and would disintegrate when empty. The Department of Agriculture is working on edible food wrappers consisting of a sprayed-on mixture of vegetable oil and glycerine triacetate which would protect the food by locking out oxygen and retarding rancidity and yet could be eaten when it melts or washed off before cooking. A photograph shows a conveyor and the sorting and processing of rubbish. In Miami Beach, service stations designated by Reynolds Metals pay ½ cent a can for cans left at the station which are then processed for reuse by secondary aluminum producers. Chicago plans to make a 1,000-ft ski slope from piled rubbish. One-way bottles are one of the biggest problems of the disposable container industry and this is the subject of a study by the Glass Bottle Manufacturers' Association.

67-0841

Krueger, O. A., K. C. Lyle, and D. E. Jackson. A chimney flammability test for certain cellular plastics. SPE [Society of Plastics Engineers] Technical Papers, 13:1052-1057, May 15-18, 1967.

In a search for a small flammability test method, a fast screening test was developed to monitor research progress on fire-resistant plastics which can be used on small samples. Particular attention was given to maximizing reproducibility and severity of surface flammability, consistent with standard requirements. The method chosen involved a chimney-like metal box with a glass front for observation. The specimen, a bar ¾ by ¾ by 10 in., was suspended inside the box in a vertical position. The apparatus, and the test procedure are described with accompanying figures. Weight percent retention data were used to evaluate the foams rather than the 'time to extinguish' since the latter measure showed larger between-specimen ranges. Tests were run comparing vacuumed and freshly cut specimens, two flame temperatures, and two times of ignition, as well as variations in specimen size. The effect of atmospheric moisture on the performance of polyurethane foams in this apparatus was found to be highly significant. Between-operator variance was found not to be significant for fourteen different additive foam formulations. Although opportunity for study was limited, there was generally an inverse relationship between flame spread (as measured in the standard 25-ft tunnel) and percent weight retained for a series of experimental foams of rather low flammability. An evaluation of foam chemistry is given which includes a comparison of differences in chimney performance of foams according to their method of preparation and their additive composition. Much additional work is required to establish the correlation between the flame spreads reported with the 25-ft tunnel and the weight percents retained in the chimney. Also, the effect of atmospheric moisture must be determined more carefully. Contrary to initial expectations, it was felt that there is no best way to reduce the surface flammability of a rigid polyurethane foam.

67-0042

Landler, Y. A new rigid cross-linked PVC foam—its chemistry and properties. SPE [Society of Plastics Engineers] Technical Papers, 13:720-724, May 15-18, 1967.

The properties of a new rigid cellular material having as its basic component a chemically cross-linked PVC, are described. Until now, rigid cellular PVC has shown a lack of dimensional stability due to internal strain, which causes an unacceptable degree of shrinkage, particularly in case of low density products. The techniques and products described in this paper solve this problem by stabilizing the internal strains, i.e., by making thermally stable strained structures through cross-linking of the PVC. The process is a discontinuous one and consists of mixing, compression molding, and expansion. The cross-linked product is based on the chemical combination of maleic anhydride with PVC through a grafting reaction and hydrolysis of this anhydride function, which through a reaction with a di- or polyisocyanate give the cross-linked product. The consitutents mixed together are PVC, maleic anhydride, vinyl monomer, polymerization catalyst and di-isocyanate. During the molding process a thermoplastic product, which is still soluble in PVC solvents, is formed. The chemical constitution of the products obtained is shown graphically. During expansion the gelled product is immersed in hot water or steam. The water first reacts with the di-isocyanate, producing carbon dioxide and a diamine. The carbon dioxide acts as a blowing agent to cellularize the product. Thereafter the diamine and maleic acid condense, building the cross-linked product. Illustrations are given showing that cross-linked PVC foam has considerably less shrinkage than the uncross-linked product. The chemical nature of the vinyl monomer and the isocyanate have a strong influence on the physical and mechanical properties of the final cellular material. The final foam can therefore be tailored to a wide range of desired properties. The strength properties, thermal conductibility, porosity, fire resistance, and water vapor permeability are improved by the cross-linking process.

67-0843

Neff, S. B. Elevated temperature chemical resistance properties of Celcon acetal copolymer. SPE [Society of Plastics Engineers] Technical Papers, 13:635-639, May 15-18, 1967.

The performance properties of Celcon acetal copolymer were studied over a period of twelve months. Injection molded tensile bars and discs were immersed in water, 10 percent sodium hydroxide, 0.2 percent Calgonite dishwashing agent, heptane, 50 percent ethylene glycol, and 10W30 motor oil--all at 180 F, as well as at lower temperatures; also 95 percent ethanol, acetone, ethylene dichloride, carbon tetrachloride, and gasoline at 120 F; water at 212 F; and various acids. Determination of tensile strength at break (psi), tensile modulus (psi times 10 to the fifth), and change in thickness or diameter (%) showed excellent resistance to the chemicals at elevated temperature, with the following exceptions: (1) Acids (e.g. 30% sulfuric) at room temperature all severely attacked the test samples, producing large changes in the properties tested. (2) Alcohol, acetone, and chlorinated hydrocarbons had a plasticizing effect, resulting in decreased tensile strength and swelling. Dissolving or stress cracking, however, was not observed. (3) Heptane had no plasticizing effect, even at 180 F. (4) Ethylene dichloride and carbon tetrachloride, tested at 120 F, produced significant weight gains and loss of tensile strength at break. (5) Gasoline had a slight plasticizing effect. It is concluded that Celcon acetal copolymer possesses excellent long-term chemical resistance to hot water, hot caustic, and to solutions of dishwashing agents as well as to most organic chemicals at high temperature. Utilization of this resin as a replacement for metals (zinc, brass) and other thermoplastics is expected to increase.

67-0844

Packagers warned on indestructibles. Refuse Removal Journal, 10(8):56, Aug. 1967.

W. F. May, chairman of the American Can Company, warns packaging manufacturers that they must develop materials that will decompose under normal weather conditions. Such action must be taken before the Federal government either directs the packaging industry to do so or initiates its own remedy. The sanitation industry faces a difficult situation with plastics, aluminum cans and foil, which are all relatively indestructible.

67-0845

Packaging wastes studied. Science News, 92(3):71, July 1967.

A contract awarded to Midwest Research Institute by the U.S. Public Health Service is briefly discussed. The kinds and amounts of packaging materials used today and the reasons for their use will be analyzed to find out how to cut the total. A major problem to be solved is what to do with glass, aluminum, and polyethylene containers which do not break down readily if just dumped.

67-0846

Rayner, H. M. On the disposal of disposables. Canadian Journal of Public Health, 58(4):177-179, Apr. 1967.

The rapidly increasing utilization of disposable items in all types of medical units has stimulated interest in methods for disposing of these items. Since many of the items are plastic (thermosetting and thermoplastic), one method of disposal is by incineration. Another method suggested is dissolving of the plastic, which could then be flushed down a drain. In the latter case, it was shown that any 'universal' solvent which might be developed would undoubtedly be toxic and also expensive, necessitating a closed circuit with solvent recovery and recycling. Other alternative methods of disposal include compaction (because most items are of low density) followed by sealing in impervious containers for collection by local authority refuse collectors, and the melting down of the medical items in special pans for subsequent removal to a specially-constructed incinerator for destruction. The 'throw away' aspect of 'disposables' is not as simple as it often appears to be.

67-0847

Rose, G. Will trash removal be a marketing factor for the glass container industry and producers of other packaging material? Glastechnische Berichte, 40(11):438-439, Nov. 1967.

The use of no-return containers and bottles in Germany and the effect on trash removal is discussed. A special tax for the producers of no-return bottles has been proposed to pay for the trash removal. However, calculations showed that the use of no-return beer bottles in Baden-Wuertemberg would increase the amount of trash by only 0.24 percent. Equipment for crushing bottles is available to reduce the volume of waste glass. The pulverized glass can be used in glass works. If incinerated, the molten glass mass improves the quality of the slag. Thus the disposal of glass containers presents no problems while, contrary to expectation, combustion of plastic containers poses various problems. Combustion of PVC containers causes severe damage in boiler units due to corrosive gases. Also the caloric value is adversely effected by plastic materials. Gases which contain hydrochloric and fluoric acids, evolved in combustion of some plastics, cause severe air pollution. (Text-German)

67-0848

Seitz, J.T., and C.F. Balazs. Application of time-temperature superposition principle to long term engineering properties of plastic materials. SPE [Society of Plastics Engineers] Technical Papers, 13:963-968, May 15-18, 1967.

The theoretical equivalence of time and temperature in their effect on viscoelastic properties of materials was applied to a predication of long term properties of two plastics from relatively short term tests at higher-than-normal temperatures. The two materials used in this study were polyethylene R-215, an ethylene-butene copolymer, and Styron 492, a rubber-modified polystyrene of the high heat, high impact variety. Compression molded samples of the materials were machined to 4.5 by 0.5 by 0.125 in. Specimens were exposed to the test temperature for 1 hour before loading. Stress-relaxation and creep experiments were then carried out, the reduced stress-relaxation modulus and creep modulus calculated, and master modulus curves plotted as reduced modulus versus logarithmic time. The time-temperature superposition principle, applied in engineering form, was successful with polyethylene R-215. It is shown by a series of graphs that 10,000 hr data can be predicted from 30 hr data with a high degree of accuracy, not only at room temperature, but at any desired temperature within the limits of the experiment. Similar results were obtained with polyethylene R-215-cored laminate with 5052-H34 aluminum skins. This phenomenon should extend to other polyolefin materials, as the principle has been used on polyethylene and polypropylene. The time-temperature equivalence concept could not be applied to the Styron 492, since a vast difference in modulus existed between 73 F and 100 F. It was shown with tests run at 88 F that a transition takes place at about 1 hr.

67-0849

Solid wastes head chides packagers. Refuse Removal Journal, 10(9):85, Sept. 1967.

Leo Weaver, Chief of the Solid Wastes Program, has classified packaging disposal as one of the most difficult solid waste problems. Glass and aluminum, which are among the commonest of packaging materials, not only cannot be incinerated, but last indefinitely when deposited on land. Mr. Weaver further pointed out, that since these problems are worsening steadily with our increasing population and the trend toward nonreturnable containers, he expects a Midwest Research Institute study to provide valuable insights for alleviating packaging disposal problems, with advantages for both industrial users of packaging, and local, State, and Federal officials with solid wastes management responsibilities.

67-0850

Strauss, E. L. Heat resistant resin system for structural composites. SPE [Society of Plastics Engineers] Technical Papers, 13:1139-1146, May 15-18, 1967.

This paper reviews the current state of development for high temperature polymers, specifically those resinous binders which are suitable for use in structural composites when associated with high-strength fiber reinforcements. Conventional resin systems, such as phenolics, are deemed useful for short exposures to 800 F, while for long-term exposures, silicones remain serviceable to 600 F. Polyaromatic resins exhibit distinct advantages over the conventional resins for high temperature service. Polybenzimidazoles have significantly higher strength than phenolics during short-time exposures at 800 F, and polyimides are superior to silcones for long exposures in air at 600 F. Pertinent data are given in summarizing graphs which correlate weight loss and tensile strength, flexural strength at elevated temperatures (for both long-time and short-time exposures), effects of long-time aging on flexural properties, and weight loss of resin systems in air and inert atmosphere. New polyaromatic heterocycles which combine the high-temperature strength of polybenzimidazoles with the oxidative stability of polyimides are under investigation. They include polybenzothiazoles, polyphenylene triazoles, polyoxadiazoles, and polyquinoxaline. Ladder (two-strand) polymers, such as pyronne and bisbenzimidazobenzophenanthrolinedione, have been shown to possess appreciably greater thermal stability than single chain polyaromatic systems. A 1,100 F temperature capability for short-term exposures is projected for these ladder polymers.

67-0851

Study to analyze packaging problem. Refuse Removal Journal, 10(8):42, Aug. 1967.

The Public Health Service has awarded $53,975 to Midwest Research Institute to study solid wastes disposal problems associated with packaging, and to find ways to minimize them. Midwest Research will analyze the kinds and amount of packaging materials used today, including paper, wood, plastics, glass, and metals, and will also study factors affecting packaging and marketing trends. Packaging material represents about 40 percent or more of the total weight of municipal refuse today.

67-0852

25 billion bottles, 48 billion cans discarded by us each year. Refuse Removal Journal, 10(9):85, Sept. 1967.

Since Americans are casting aside a mountainous volume of packaging debris, including 25 billion bottles and 48 billion cans annually, the packaging industry has begun to express concern. It is pointed out that the packaging industry is partly responsible for making the disposal problem more difficult by utilizing containers which are difficult to dispose of completely. Two proposals are suggested to remedy the situation: (1) The industry should set up its own council to seek out solutions. (2) More research should be conducted on degradable containers. An example of a degradable container, easily crushed and disposed of, is the fiber-foil container now being used increasingly for frozen juice and for motor oil.

RECYCLING

67-0853

Accent on reclamation of non-ferrous scrap. Metals, 2(17):50-51, Oct. 1967.

The highlights of papers presented at the Scrap and Waste Exhibition are discussed. Scrap segregation is of prime importance since removal of impurities during refining usually involves metal loss. In spite of the wide use of chemical and spectographic methods for scrap identification, reliance must be still placed on skilled scrap sorters. Therefore, a simple, relatively cheap analytical instrument for identifying a wide range of waste metals is needed. Other issues discussed include air pollution caused by scrap metal refining, a smokeless solution to the reclamation of scrap cable using the USI-Cumberland granulator, the make-up of furnace charges for producing a given alloy composition, and general problems in the reclamation and reuse of industrial waste.

67-0854

Activated sludge as source of vitamin B12. Compost Science, 7(3):6, Winter 1967.

Activated sludge from filters of polysaccharide hydrolysis plants serve as a source of vitamin B12 for chickens and piglets. Activated sludge from filters of bituminous-shale-processing wastes can be a source of vitamin B12 for animal husbandry. Research on this has been done in Russia.

67-0855

Allison, K. Those amazing rubber roads. Rubber World, 155(6):47-52, Mar. 1967.

Experimentation on the usage of rubberized roads and asphalt shows increased road life and fewer accidents. However, municipal authorities have not appropriated sufficient money for construction due to political pressures. The four most common methods in the United States of incorporating rubber into the final asphalt road mixture are discussed. British engineers report that undissolved rubber ('crumb rubber') has no beneficial effect and may make compaction of asphalt surfacing more difficult. Powdered or flaked rubber disperses readily throughout the molten asphalt. With latex liquid additives, the rubber dissolves and separates evenly throughout the asphalt. The aggregate coating technique involves addition of a special reclaimed rubber product to the heated aggregate in the pug mill before mixing in the asphalt. The additive coats and encapsulates each aggregate particle in a rubberized sheath. U.S. Rubber Reclaiming is selling a product based on this concept. Costs and data for methods of rubberizing roads are given.

67-0856

American aspects. Waste Trade World, 110(2):10-12, Jan. 14, 1967.

A review of the key industrial commodities is reported by the National Association of Secondary Material Industries Inc., New York, in its annual year-end statement. Acute world problems seemed to affect both directly and indirectly the market position of nearly all secondary metals; prices for copper, lead, zinc, and aluminum seemed affected by international events as well as by domestic supply and demand. Unprecedented demand for copper was expected to return to normal by year's end and, in April, sharp breaks took place on the London Metal Exchange. However, disputes between Zambia and Rhodesia over copper sent prices rocketing on two different occasions before the end of 1966. The aluminum industry experienced a well-balanced supply and demand for 1966, with stability which contributed greatly to continued growth in the use of aluminum in established markets as well as spreading to new fields. Although brass and bronze ingot shipments improved during 1966, the industry would have suffered due to the drop-off in the construction and automotive industries if it were not for defense production requirements. Price reductions in zinc scrap occurred during the first half of 1966, then steadied, but prices on the lower grade items began to erode again slowly. Lead moved quite well in 1966, with secondary lead in demand, despite market declines. Scrap metal prices went sharply up and down throughout the year, although as a whole 1966 was a good year for the nonferrous scrap metal industry. The first half of 1966 was excellent for the paper stock industry, but in late summer inventories of paper stock rose and old corrugated and double-lined corrugated cuttings dropped in price to their lowest level in several years. Comments are made about the export market in metals and paper-textiles during 1966.

67-0857

Animal-man-made fiber sorting now a promising commercial proposition. Waste Trade World, 111(13):3, Sept. 16, 1967.

No difficulties are anticipated in scaling a laboratory electrostatic technique for separation of animal from some man-made fibers to a commercial process. The laboratory method was developed at Leeds University, by Dr. Chamberlain, for the Reclamation Trades Research Organization. The commercial development is being undertaken by the Chadwick Machine Co. of Cleckheaton. The rags are ground into individual fibers and passed by air stream through an electrostatic field between two oppositely charged metal plates. If the electrostatic charges on the fibers are different there will be a separation of the fibers since a water repellent synthetic such as terylene will have a positive charge and an animal fiber such as wool will carry a negative charge. The collected fibers are sucked off the plates to separate containers. Whether or not the fibers can be separated can be tested by the use of a glass rod that has been charged by rubbing. Water repellency is also a guide since water repellent synthetics are likely to have a positive charge and water absorbent materials are likely to have a negative charge. Wool and mohair cannot be separated by this method and vegetable fiber separation depends on carbonization. It is unlikely that papers could be sorted this way since they would have to be reduced first to individual fibers. The only problem remaining in the commercial development involves the regulation of the air stream which carries the fiber to the electrostatic field to provide an output sufficient for a commercial possibility.

67-0858
Ashcroft, J. Waste is becoming vital. Waste Trade World. 111(23):8, Dec. 2, 1967.

The effect of the British devaluation of currency on the waste trade in Britain is discussed. Waste traders will be in a position to improve the wealth of the nation as a whole as well as of their own companies--a welcome change from the many years that the firms have worked hard on the narrowest of margins. Yet even now there will be improvement only for those who push hard for more trade at better gross margins. The cost will increase for all raw materials purchased from countries which do not devalue their currencies in line with British devaluation, and it is up to waste traders to find ways in which their reclaimed materials can be offered as substitutes. Waste traders need to utilize all possible sources of information, the ways in which trade increases during the next few months, and the ways reclaimed waste could be utilized. Those firms which make goods from raw material bought in countries which have not devalued, and which sell finished products either in Britain or in countries which have devalued, will be hardest hit by the recent changes. A higher percentage of British-produced secondary materials is their only alternative to trade-crushing increases in selling prices. An itemized account of the import-export situation indicates that even in better months during recent years, the country has done no better than break even. The solution involves a reduction of the proportion of imports relative to exports, and what more effective way of doing this than by use of British-produced materials?

67-0859
Automobile scrap for electric furnaces? Iron Age, 200(26):18, Dec. 28, 1967.

A test program at the U.S. Bureau of Mines' Albany Metallurgy Research Center will give information on questions concerning the use of prepared automobile scrap and prereduced iron ore. Tests are being conducted on shredded scrap, sheared scrap, No. 2 bundles, pig iron, prereduced powder, pellets and briquettes. Based on 25 heats in a one-ton furnace, it was concluded that the continuous addition of prereduced material to molten auto scrap in an electric furnace appears to have certain operational advantages over conventional coldmelt, batch charging techniques. Diluting the automobile scrap with the prereduced material is an effective method for lowering the copper content in steel made from auto scrap. Heat times are shorter, electrical energy consumption is lower, the energy input rate is improved, and the technique is more flexible in that it allows varying ratios of charge materials.

67-0860
Bagasse is basis for sugar industry's steam balance. Engineering and Boiler House Review, 82(9):265, 267-268, Sept. 1967.

Bagasse, the primary energy source for the growing South African sugar refining industry consists of the crushed cane after extraction. It is often used with coal or wood as an auxiliary fuel although it is a difficult fuel to handle. Some of the sugar industry's bagasse/coal fired boilers are described. A photograph of the Reynolds Bros. sugar factory at Sezela in Natal and a half section drawing of the Nos. 7 and 8 Yarrow boilers at Sezela are shown. Bagasse contains 47 percent carbon, 6 percent hydrogen, 45 percent oxygen and 2 percent ash. The fuel, containing 53 percent moisture, is fired 'as is'. The bulk density is 7 1/2 lb per cu ft, loosely packed and the average calorific values are GCV 4,200 Btu per lb, and LCV 3,200 Btu per lb. The heat energy from the bagasse is the basis for the steam balance of the refinery with the ideal being a small surplus of fuel with a storage and recovery plant. Spreader stokers have proved to be effective in burning bagasse. The two bagasse/coal stoker fired boilers recently installed at Sezela in Natal use coal, bagasse, or a combination of these fuels on twin Rotograte stokers with a rating at mcr load of 125,000 lb hr of steam at 300 lb per sq in. and 620 F final steam temperature when burning coal and 300 lb per sq in. and 645 F when burning bagasse. Although bagasse is accepted as a primary fuel in the sugar industry, much greater use of bagasse for other purposes is indicated by its potential for use in the paper industry.

67-0861

Baling on mill sites. Widespread concern in the industry. Waste Trade World, 110(13):3-4, Apr. 1, 1967.

The procedure of installing baling presses at steel mills is becoming popular. The mills usually rent the press to individual merchants so that scrap can be sent direct from source to mill, thus bypassing the scrap yard. Costs can be reduced by 6s to 10s a ton. However, a firm that originally adopted this practice can no longer use the baling press because of a switch from open hearth to electric arc furnaces that has resulted in making the bales too large. The smaller bale sizes required by some arc furnaces do not make the practice economically feasible unless the merchant finds subsidiary outlets in foundries and specialist steel mills. This problem has led one steelworks to install not only a baling press, but two sets of shears so that both heavy and light scrap can be sheared to the desired dimensions. They have licensed a merchant to process their scrap on the premises and pay him a processing charge. Another mill found that their output was not sufficient to require enough scrap to keep the baling press fully occupied. In any case, the trade associations are concerned over the trend, although an authority in the steel industry believes that the practice is unlikely to become universal since it would then be no more of an advantage to the mills than it would to the waste trade merchants.

67-0862

Bennett, H. J. Iron and steel scrap in the Intermountain and Northwestern Plains States. U.S. Bureau of Mines Information Circular No. 8344. Washington, U.S. Department of the Interior, 1967. 71 p.

The processing and marketing of iron and steel scrap in the intermountain States of Arizona, Colorado, New Mexico, Utah, and Wyoming and the northwestern Plains States of Nebraska, North Dakota, and South Dakota are presented. The quantity and quality of iron and steel scrap consumed in both the steel mills and iron foundries in these States in 1964 were decided by: the type of facilities used to produce an end product; the availability of a dependable source of iron and steel scrap at competitive prices; and the ratio of the cost of iron in iron ore to iron in scrap. Data on the origin, areas of collection, movement, and consumption of ferrous scrap and the effect of new or modernized processing methods and equipment, the structure of the industry, statistics of scrap consumption by area, grade, and furnace types, and the future outlook for the ferrous scrap industry in the area are summarized. Numerous statistical data and specifications are appended.

67-0863

Blast furnace slag dried by baffle burners. Metallurgia, 75:78, Feb. 1967.

A 28-million-Btu-per-hr dual fuel burner replaced the original gas burner at the Gartsherrie Iron Works. It fires a rotary drum slag dryer which handles 10 1/2 tons of slag per hr with moisture content up to 33 percent. Molten slag is tapped into a stream of high pressure water causing the slag to solidify into granules for cement. The burner burns oil or gas.

67-0864

Boards from agro-industrial wastes.
Science Journal, 3(11):27, Nov. 1967.

A process developed by the Regional Research Laboratory at Johat, Assam (India), for the manufacture of particle boards, roofing boards, flooring tiles, table tops, and similar items using agro-industrial wastes as raw material, is described. The thermomechanical process is based on the binding capacity of the functional groups of the cellulosic material. Its novelty lies in the total elimination of synthetic glues such as phenol-formaldehyde or urea-formaldehyde resin used as binders in most conventional board manufacture. For the India board, wastes such as sawdust, paddy husk, groudnut husk, wood wastes, spent tan materials, coconut husk, jute sticks, barks, and forest management wastes (including tops of trees) can be used. A standard particle size of 14-100 BS mesh is recommended. The water percentage is brought to about 20, acids and/or urea are added for waterproofing, the mix is uniformly distributed over a caul and is hot pressed for 30 minutes. The boards are then annealed. Output of the Johat process is given as 3,000 to 9,000 tons per year. The boards it produces have tensile strength of 125 kg per sq cm, compression strength of 145 kg per sq cm,, and bending strength of 28 kg per sq cm, even after maximum absorption of 3 to 5 percent water.

67-0865

Boost your profits with tool scrap.
Canadian Metalworking/Machine Production, 30(7):42-44, July 1967.

Approximately 85 percent of the users of tungsten carbide sell tool scrap along with their regular scrap at $21 to $27 per ton. Separated tungsten carbide which could bring $3,000 a ton is being discarded at the rate of 1 million lb a year in Canada. Every $20 spent on tungsten carbide produces $1 in scrap. Because of a lack of awareness of the true market value, one Canadian company is selling 50,000 lb of tungsten carbide for ordinary scrap prices. The tungsten carbide can be recovered from heading dies, throw-away inserts, drawing dies, shape dies, milling cutters, rock bits, and cutting tools. A salvage director should supervise the scrap recovery and detect excessive waste from any department. Key salvage employees should be equipped with a chemical analysis kit (cost $50) to trace the precious metals back to their plant source. Color coded containers will prevent mixing high and low value scrap. The tool crib operator should require the exchange of worn tools and scrapped materials for new ones. One dollar saved in salvage equals the profits on $100 in sales. Photographs include a barrel of tungsten carbide worth $3,000, quality control inspection to reduce scrap, grinding of brazed tool tips, and photomicrographs of reclaimed and commercial tungsten carbide. Canada supplies 3.1 percent of the world production from one mine, and the United States only 4.5 percent of the world production with 44.4 percent coming from China. A valuable material is being wasted because of failure to recognize its value and recover it by simple mechanical sorting.

67-0866

Bopp, R. A new shear for bulky waste.
Public Cleansing, 57(10):517-519, Oct. 1967.

A new Von Roll shear for bulky refuse is described. Unlike conventional machines, which grind the refuse, this shear cuts it up. Maximum throughput depends on the composition of the waste and ranges from 157 to 260 cu yd per hr. Loading, which is automatic and controlled by one crane driver, is through the large horizontal feed opening, measuring 9 ft 10 in. by 11 ft 2 in. The machine consists essentially of two multiple steel frames linked in a V-shape, with cutting blades bolted to one face of one frame. When closing, the beams of the moving system swing into the spaces of the fixed frame, catching bulky refuse and cutting it with the blades. Power is provided by a 37 kw motor and hydraulic pump. If the maximum permissible oil pressure of 2,100 psi is exceeded, the machine automatically reverses movement and the refuse slides further down and closer to the pivot of the cutting system. The resultant increased leverage will permit shearing in the next operating cycle. Cutting blades are made of chrome-vanadium-steel, each with four cutting edges, of which only one is engaged. Thus, cutters can be reversed 3 times before resharpening is necessary. This machine works with very little noise and without creating any dust. It is relatively light-weight, weighing about 28 tons. Von Roll also supplies a similar machine, but with only one moving frame section, which is especially suitable for industrial waste from chemical plants

67-0867

Boxcar salvaging operations studied. Refuse Removal Journal, 10(6):31, June 1967.

The Solid Wastes Program has awarded a $50,000 contract to Booz, Allen Applied Research, Inc. of Bethesda, Maryland, to carry out a comprehensive study of railroad car dismantling and recommended new approaches to eliminate pollution problems and still have economic disposal of obsolete cars.

67-0868

Bricks from discarded silt. Environmental Science and Technology, 1(2):111, Feb. 1967.

Silty clay waste materials, a potential water pollution hazard, may be made into inexpensive brick for building.

67-0869

Brown, R. S., and A. B. Netzley. Incineration; Drum reclamation furnaces. In Air pollution engineering manual. Public Health Service Publication No. 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967. p.481-495.

Open-top steel drums used for transportation and storage of chemicals may be cleaned by burning the combustible materials, at a cost lower than chemical cleaning. Burning is most efficient in refractory-lined furnaces which are classified as to type of process--batch or continuous. The same basic factors of combustion volume, burner capacity, and combustion air differ markedly. Temperatures do not exceed 1,000 F in either process to prevent warpage and scale formation. Regulations require the afterburner or secondary combustion chamber to raise the maximum volume of effluent to 1,400 F for at least 0.5 seconds to insure complete combustion of elemental carbon. Insulating materials for drum reclamation furnaces should have a service temperature of at least 2,000 F. A problem illustrates the design of a continuous-tunnel type furnace for processing 150 open-top steel drums per hr.

67-0870

Butler, D. M., W. M. Graham, F. C. Hamburg, et al. A study of improved methods for dismantling railroad freight cars. Bethesda, Md., Booz, Allen Applied Research Inc., Oct. 30, 1967. 89 p.

A 6-month investigation was carried out under contract with the Solid Wastes Program, National Center for Urban and Industrial Health, U.S. Public Health Service, to determine the best methods for railroad car dismantling. Of the approximately 70,000 rail freight cars which are dismantled each year, about 50 percent contain 3 to 7 tons of wood each which must be removed before the scrap iron and steel can be returned to the steel-making process. Since conventional means of removing wood by open burning produce dense smoke emissions, more than 40 alternate schemes were selected for investigation. Two approaches which appeared to have the most merit were a system of cutting wood from the cars using high pressure, manually-operated water jets and a system of using the car itself for an incinerator.

67-0871

Cadmium from zinc smelting wastes. British Chemical Engineering, 12(11):103, Nov. 1967.

The recovery of cadmium of high purity from the waste liquors of zinc smelting operations is described, using a new process based on solvent extraction. A plant which will utilize this process is now being constructed. Flue gases from the sintering of zinc and lead ores are cleaned by gas washers and electrostatic precipitators before entering the sulfuric acid plant. For recovery of the cadmium values the wash liquors, after settlement and filtration, are passed through an ion exchange column where the metals are adsorbed. Experiments on solvent extraction as an economical method of separation led to the development of two processes, one using tri-n-butyl phosphate (TBP) as the extractant, and the other using naphthenic acid in kerosene solution. The TBP process, which makes use of a multistage countercurrent flow system, appears to be the more desirable. The pilot-plant mixer-settlers, built in Perspex, are of a simple basic type with a variable height weir to control aqueous-solvent interface level in settlers (illustrated by diagram).

The separation was shown to be independent of variations in the Cd and Zn concentrations and was effective at pH values of greater than 2. Cadmium to zinc ratios of 10,000 to 1 are readily attainable by this method, and cadmium chemicals of a purity comparable to that achieved via the refined metal can be prepared from the resultant solution after further chemical purifications to remove minor quantities of other elements.

67-0872

Callihan, C. D., R. W. Pike, and E. J. Stone. Development of simple chemical-microbial processes for the utilization of low grade cellulosics in single cell bacterial and yeast protein production. In The development of food from cellulosic waste for human and animal consumption. Baton Rouge, Department of Chemical Engineering, Louisiana State University, July 1967. p.14-27.

Recent studies have shown that a low-grade cellulosic (such as bagasse) can be chemically modified to increase its digestibility in ruminants from 25 percent to 60 percent of the total fiber. Microbes have been isolated which appear to rapidly degrade highly crystalline, pure cellulose to the disaccharides. A considerable portion of the research attempted in the past has been aimed at finding uses for the waste products of pulp and paper mills. Research on the digestibility of lignin shows that it will not serve as a poison or inhibitor to the organisms growing on carbohydrate in the presence of lignin. This concept is important if low grade cellulose sources, such as sawdust, and bagasse which may contain large amounts of lignin, are to be utilized as substrates. A pilot unit for the chemical and microbial treatment of low-grade cellulosic materials has been designed and is under construction. Specific aims of the investigation are: to chemically treat sawdust, wheat straw, rice straw, bagasse, and Johnson grass; to develop production techniques for cellulose degrading bacteria and for growing yeast protein from cellulosic substrates; to produce feedstuffs for ruminants; and to process the protein concentrate so that the product will be tasty and desirable. An economic analysis of the cost of producing protein was made.

67-0873

Carefully chosen baler. Waste Trade World, 111(26):14-15, Dec. 23, 1967.

The 'Nupress' baler, found by the Salisbury City Council to meet their five requirements for an additional baler for handling a sudden increase in waste paper, is described. The requirements include simplicity for operation by a non-mechanically minded person, versatility for handling mixed waste, fiberboard, and newspapers, capacity for production of 4-cwt bales of mixed waste or news, and ability to be fed mechanically or by hand and to bale twice as fast as existing balers. After initial installation at ground level proved inefficient, the baler was located in the pit so the movable box was close to the edge of the pit and level with the shed floor. All gaps between the shed floor and the baler were filled in and a control panel was conveniently mounted for the operator who pushes the material with rake or brush into the filling box. Upon completion of a bale it is wired and lifted out with an air hoist suspended from an overhead joist. The baler, in conjunction with the system of split level feeding, provides economy through low manhours, ease of servicing, resistance to damage, and operation by unskilled workers.

67-0874

C-a-rrr-u-n-c-h----- from this.... Public Cleansing, 57(12):656-658, Dec. 1967.

The first of two Lindemann Newell car shredding plants in Great Britain was opened at St. Helens on Oct. 6, 1967. It has the capacity to produce 2,500 tons of good quality metal scrap per week and will process unwanted cars, stoves, washing machines, refrigerators, etc. The £500,000 plant is controlled by an auto-transformer starter rated at 3,250 hp to operate on 6.6 kV, and is designed to convert a car body into steel scrap in 15 seconds. A mobile clam grab feeds material into the 20-ft long bed, the lid of which flattens the scrap which is then pushed by a hydraulic ram (2,000-lb-per-sq-in. pressure) into the shredder. The scrap continues to be fragmented until the pieces are of a size to pass through an 8-in. square apertured grill. From there it progresses onto a vibrating screen, where the extraneous dirt, etc., drops through into storage containers. At the end of the screen a rotary electromagnet picks off the ferrous scrap and places it onto an inclined conveyor belt, while the rest--non-ferrous metals and other matter--drops onto an inclined conveyor set at right angles. This leads to picking positions where the non-ferrous metals are removed. The ferrous metal is fed spirally through a horizontal rotary, gas-fired (300 C) furnace. At the exit of the furnace, a rotary magnet removes the ferrous scrap and it is conveyed directly into railway wagons. The whole plant is controlled from a console within a cabin overlooking the feed-bed.

67-0875

Ceramic reclamation--improved process. British Chemical Engineering, 12(9):1406, Sept. 1967.

An improved reclamation process which reduces the waste materials from extrusion and pressing of industrial ceramic materials to a fine powder suitable for reconstitution and which eliminates external screening is described. The previously used disintegrators involved a two-stage process in which disintegration was followed by screening to remove and return oversize material to the disintegrator for retreatment. In the new process, the waste material is passed directly to pulverizing mills suitable for particles up to 2 in. in diameter. Integral mill screens eliminate the external screening and deliver the fine powder immediately. Since no contamination of one ceramic material with another is permissable, a number of mills have been installed resulting in savings in time and improved efficiency.

67-0876

Champagne send-off for fragmentation plant. Steel Times, 195(5179):504, Nov. 1967.

The Lindemann-Newell unit installed at St. Helens (Lancs) by Fragmentation Heckett-Birds, Ltd., is claimed to be the first fully-automated fragmentation plant in the U.K. for converting car bodies and other forms of light scrap into a high-grade material for iron and steel making. A photograph of the plant is given. A brief 'description' of the plant's operation is given in the context of the commissioning ceremony.

67-0877

Chedd, G. Fertilizer from flue gases? New Scientist, 36(569):281-283, Nov. 2, 1967.

A dry process for the extraction of sulfur from flue gases, with elemental sulfur as its product, which was developed by the U.S. Bureau of Mines, was investigated by the Central Electricity Research Laboratories (CERL) in Great Britain. The absorbant, from which sulfur could be removed by a reduction process, is alkylized alumina. CERL set up a research project to study the nature of the absorbing material, the detailed chemistry of the gas-solid interaction, and the chemistry of the recovery process. In the CEGB version of the alkylized alumina process, the rain of alkylized alumina particles is replaced by a fluidized bed of high porosity sodium aluminate. The sulfur dioxide from the flue gases diffuses into the pores of the alumina and reacts to form a mixture of sodium sulfite, sodium sulfate, and aluminum oxide. This mixture is passed into the solids regenerator where it meets an upward flow of hydrogen, which reduces the sulfate/sulfite mixture to hydrogen sulfide. One-third of the hydrogen sulfide is then oxidized to sulfur dioxide and the two gas streams are mixed and passed over a bauxite catalyst from which elemental sulfur is produced. A full scale pilot plant has been designed to produce 10 tons of sulfur a day from a power station, with the intention of building a follow-up unit which will produce 1,000 tons a day.

67-0878

Chicago considers rag-picker plan. Refuse Removal Journal, 10(3):46, Mar. 1967.

An alderman in Chicago's City Council introduced a proposal to allow licensed rag and paper-pickers to work ahead of the city's collection service picking up newspapers and magazines worth $1,600 a week if resold.

67-0879

Chip drying system...increases machining scrap recovery. Mill and Factory, 81(6):63, Dec. 1967.

The problem of salvaging 'wet' chips, generated from machining operations, is described. Chips which are wet from cutting oil or moisture are unsuitable for briquetting, and the oil that they contain creates dense smoke in the cupolas and causes problems in the melt. Yet the quantities of wet chips being generated are so great that a large amount of money could be saved if they could be salvaged. A new chip processing and handling system was investigated by International Harvester Co. last year and was later installed. All cast iron chips, both wet and dry, are now processed through the Link-Belt Co. system which is controlled by one operator at a single panel. The system removes oil from wet chips, screens out tramp iron and other trash, mixes dry and de-oiled chips together, and conveys the mixed chips to the briquetting equipment. The Link-Belt extractor, which is the key cost saving element of the system, is described. It uses high-speed spinning action for de-oiling and de-watering. The extractor works on an automatic cycle and rotates at half speed during chip charging to balance the load, but spins at full speed while extracting oil and water. Then it stops to discharge the dried chips into a receiving hopper. The extractor subjects the chips to a centrifugal force of approximately 350 G's at the peak of the cycle. One shift operation of the system can dispose of the chip accumulation of three machine shop shifts. The system is capable of salvaging tens of thousands of dollars per year of wet oily chips that formerly wound up on the scrap market.

67-0880

Claghorn, A. U. What are economics of secondary fiber usage? American Paper Industry, 49(11):84, 86, Nov. 1967.

The importance of an analysis of the economics of paper stock for the efficient operation of paper mills is stressed. Parameters such as cost savings, the ability to create superior quality characteristics for particular end uses, and the effect of usage, are discussed. It is pointed out that several economic questions, to which answers have not yet been found, should be investigated before a mill can arrive at an intelligent decision concerning the purchase and use of paper stock.

67-0881

Cohan, L. J., and J. H. Fernandes. Potential energy conversion aspects of refuse. ASME Paper 67WA/PID-6. Presented at Winter Annual Meeting, American Society of Mechanical Engineers, Pittsburgh, Nov. 12-17, 1967. 7 p.

Today refuse may average 10 percent or less garbage, with an overall moisture content of 15 to 20 percent. It is characterized by large quantities of paper bags, crates, and similar dry, combustible material. Industrial refuse has increased amounts of plastics and other synthetic materials, many of which have high heating values with little or no moisture or ash. If the energy in the flue gas of incinerators is considered as a useful by-product instead of the current wasteful heat dissipation, various energy utilization schemes could offer sound economic trade-offs. Calculations indicate that there is the potential of substantial return to incinerator operators of about 6,500 kw hr available for sale after incinerator requirements are met. Should the incinerator be in a complex which could use electricity, the steam would be valued at $0.01 per kw hr. If the steam were sold to a nearby district heating system or process plant the value might be as much as $0.50 per 1,000 lb. Incinerator heat may be utilized for: regenerative feedwater heating, district heating, district air conditioning, refrigeration, desalination, separately fired superheaters, and incinerator gas turbines. The various schemes are described and illustrated.

67-0882

Cole, J. I., and H. S. Moss. Copper rod from scrap copper. Automation, 14(12):51-54, Dec. 1967.

The development of the continuous casting and rolling method for converting copper scrap into copper rod is described in detail with accompanying diagram and photographs. Scrap copper is charged, melted, and refined in a 75-ton reverberatory furnace. When ready to cast, the refined molten copper is delivered to the induction heated holding furnace and then to the mold cavity on the casting machine. The copper is solidified in the mold by cooling both the mold and the steel band that closes the mold with water sprays. The casting is then stripped from the wheel mold and conveyed to a fourteen-stand, tandem hot rolling mill in which the 2.40-sq in. trapezoidal-shaped casting is reduced to a 5/16-in. diameter rod. The rod is further cooled by water in the coiling pipe, and is then coiled at the coiling basket. To remove any oxide scale that may have formed, the rod in coiled form is pickled, rinsed, and coated with a detergent solution in a series of tanks. The new continuous casting and rolling method already produces a superior quality rod at a lower per unit cost than the currently used wire-bar process; it is estimated that the cost of converting copper scrap to copper rod will be reduced by 50 percent when the new method is fully developed.

67-0883

Collection trailer. Waste Trade World, 111(5):21, July 29, 1967.

A trailer designed for salvage collection which is available in a 6 1/4-cu yd and a 11-cu yd capacity in the ₤116 to ₤195 price range is described. The trailer made by M.F.R. (Sales) Ltd. is built on a chassis of square hollow section tube with the body fabricated of panels of heavy gauge material supported by a rigid angle and formed section framing. There is a rubber-bushed suspension and a ratchet parking brake mounted on a specially designed extra-long towbar strongly supported at the contact point with the body of the trailer to eliminate the normal strain in this area. The lighting equipment is protected by a pressed channel. A special model is available with zinc-coated steel panels and shock absorbers for service where maintenance facilities are not available. An illustration shows the regular M.F.R. trailer for salvage collection.

67-0884

Concrete reinforced with scrap car steel. Waste Trade World, 110(23):13, June 10, 1967.

A report is made of tests to be run on the load-bearing characteristics of concrete block and column segments with reinforcing cores of crushed car scrap. The U.S. Bureau of Mines has awarded a contract to Lok-Blok Inc. of Hornell, New York, to test concrete blocks and column segments to determine precisely how much strength is gained by adding car scrap cores to concrete. The contract, which will run for eight months, is another approach by the Bureau of Mines in its hunt for useful applications for car scrap now littering many areas. The lower cost of load bearing columns and walls of car scrap-reinforced concrete should interest the building industry. Several builders are interested in the possibility of the substitution of this new material for steel girders and reinforced concrete in some types of buildings. The Lok-Blok Inc. will both build and test the blocks and circular column segments. A potential demand for scrap car steel is possible depending on the results of the tests.

67-0885

Council utilize wire belt conveyor. Waste Trade World, 111(5):20, July 29, 1967.

A Wedco wire belt conveyor with an open weave is important in the utilization of 30 tons of waste paper and mixed waste which are collected weekly by the Warrington Corporation from shops, factories, and other businesses in the area and provide the Corporation with an income of ₤112,000 a year. Two pictures are shown of the installation, one of which shows the charging and sorting end of the conveyor with the fiberboard sorted and being conveyed to the baler. The other illustration shows the conveyor discharging sorted material into the baler. When the paper arrives at the council depot after collection in modern rear-loading vehicles, it is discharged onto the tail of a Wedco wire mesh belt conveyor set into the floor. There is only a small clearance on either side of the conveyor so that the tipped waste falls on the conveyor or close enough to facilitate picking. The open weave of the wire mesh belt of the conveyor allows dust and other foreign matter to fall through to a steel deck just below the belt level of the section in the floor. The conveyor lifts the paper to a section at a convenient height for sorting and then to a Powell continuous baler which delivers bales weighing from 150 to 200 lb. A torque limiting device on the conveyor drive unit prevents damage in case of overload or jamming. The bales are stored in a separate area until sold and then they are loaded to the deck of the collecting vehicle by a portable elevator.

67-0886

Crane's three simultaneous moves. Waste Trade World, 111(23):14-15, Dec. 2, 1967.

A crane that can hoist up to 35 tons and at the same time slew and move forward and backward is described. It is designed for handling heavy duty unit loads, and continuous derricking under full load at every point of the arc is made possible by a bevel gear reversing mechanism of new design. The range includes the 851C, a crawler-tracked chassis, the 851T, mounted on a truck chassis, and a model mounted on a six- or eight-wheeled chassis. All jib head hoist blocks and derricking sheaves are mounted on tapered roller bearings with life-long sealed-in lubrication. The hoist load at a 10-ft radius is 35 tons; at a 25-ft radius it is 5 tons; and at both 100- and 150-ft radii it is 0.8 ton. The hoisting brake is continuously engaged throughout motion and gives unique control when lowering a load. Engine-controlled lowering can be carried out at speeds of up to 165 ft per minute, and a three-speed gearbox gives precise control over the final positioning of the load. The firm which produces the crane believes that the built-in safety factors are unmatched by any other crane.

67-0887

Dahm, H. P., and E. Dannevig. The reclamation and utilization of fines from the fractionization process. Norsk Skogindustri, 21(11):432-436, Nov. 1967.

The study investigates the recovery of fines by flotation. After a separate alkaline treatment, fines from spruce and hardwood sulfite pulps are rendered fairly harmless and may be returned to the main pulp in the alkali stage of the bleaching. No separate washing and thickening of the fines is necessary, and the surplus alkali is utilized. It was found that more than 90 percent of the fines could be recovered by flotation. With pine sulfite pulp, little is gained by a separate treatment of the fines compared to the treatment of the whole pulp with alkali. The suggested method makes possible the recirculation of large quantities of water in the pulp screening stage and therfore reduces the fresh water demand. (Text-Norwegian)

67-0888

Danielson, V. A., J. F. O'Neill, and H. W. Ahrenholz. Iron and steel scrap in the Southeast. U.S. Bureau of Mines Information Circular No. 8342. [Washington] U.S. Department of the Interior, 1967. 85 p.

The Bureau of Mines examined sources, consumption, and movement of iron and steel scrap in the southeastern States--Alabama, Florida, Georgia, Kentucky, North Carolina, South Carolina, and Tennessee. Officials of the scrap-processing and scrap-consuming industries were interviewed and a canvass was made by the Bureau of Scrap Consumers. Scrap is one of the important resources of the Southeast. The main difference between scrap and other resources is that scrap is constantly generated in the manufacture of new iron and steel. As the quantity of iron and steel products manufactured increases, the amount of scrap generated also increases. Numerous illustrations and tables are furnished. Significant trends in processing scrap in the Southeast are: the preparation of smaller bundles or 'briquettes' weighing from 75 to 150 lb, which are easier for consumers to handle and inspect; and the shredding of automobile scrap which produces a dense, clean scrap especially desirable for use in electric furnaces. The transportation of scrap, demand and supply, production, trends in prices, and consumption are also discussed.

67-0889

Dessauer, R.G., H. Mayer, and E. J. Patzner. Recovering semiconductor waste material. IBM Technical Disclosure Bulletin, 10(1):98, June 1967.

A technique for recovering semiconductor waste material that is scrapped or discarded from semiconductor processing operations is summarized. Scrap semiconductor material, like silicon, is fed at a constant weight rate into a water-cooled melting boat. The boat is in a quartz tube in an inert gas atmosphere. A RF coil surrounds the apparatus, and a previously prepared ingot extends from the molten zone under the coil out the other end. The process is explained briefly, and considerations such as irregular-sized scrap silicon, loading by conveyor belt, and minimum operator supervision are discussed.

67-0890

The development of food from cellulosic waste for human and animal consumption. Baton Rouge, Department of Chemical Engineering, Louisiana State University, July 1967. 104 p.

An interdisciplinary research project is underway at Louisiana State University has as its goal the development of food for human and animal consumption. A proposal is made to the Agency for International Development to request support to continue this project. For each project, a detailed description is given including the specific objectives of the research and its interrelation to other studies. The basic process involves simple fermentation steps, and the raw material will be cellulose waste which occurs in many forms throughout the world e.g., rice straw, bagasse, saw dust, etc. The product will be single cell and yeast proteins that can be readily incorporated into the diet of the indigenous population by preparing food acceptable to the population and by animal feed which in turn yields animal protein. The cost of producing protein by this process is estimated to be 9 cents per lb. This conservative estimate is based on a 20 ton per day production rate of a 95 percent protein concentrate. Projects are being conducted: development of single cell proteins from cellulose substrates, development of simple chemical-microbial processes, study of the role of single cell proteins in human nutrition, development of nutritious and acceptable foods and animal feeds, and studies in food attitudes and attitude change. Bibliographies for each project are included.

67-0891

Diamond, Gerald X. Cheap sand reclamation. Modern Castings, 52(6):10, Dec. 1967.

A low-cost sand-reclamation technique, which uses a fluidized bed, is described. Without reclamation, sand mixtures bonded with oils, resins and sugars for shell molds cannot be reused because remnants of bonding materials left over on the sand grains impair strength of the molds and cores. The technique involves the burning of a gas and air mixture (1:4) in a combustion space formed by porous catalyzed plates. Combustion products keep the sand formed by porous catalyzed plates. Combustion products keep the sand in continuous turbulent motion, heating it rapidly to 800 to 900 C. Next, the sand passes to a cooling zone where a stream of cool air keeps it fluidized. The operation may be fully automated, since sand in the fluidized layer behaves like a liquid, flowing spontaneously through the reactor whose bottom slopes one degree. Output is about 1,000 lb of sand hourly for each sq m of combustion area. About 85 cu m of city gas with a heating value of 3,600 kcal per cu m plus about 1,900 cu m of air for cooling and combustion are needed. The equipment is simple and cheap and the attention needed is minimal.

67-0892

Dry separation of U and Zr in atomic fuel elements. British Chemical Engineering, 12(11):62, Nov. 1967.

A new process, developed by the Chemical Division of the French Atomic Energy Commission, which permits the recovery of enriched uranium from fuel element production waste, or the treatment of such elements after irradiation, is described. The basis of the process, which is 'dry', is the separation and purification of uranium in the form of its hexafluoride. The basic steps include: the removal of zirconium as volatile tetrachloride by the action of anhydrous HCl at 250 to 500 C; the conversion of the uranium chloride to the hexafluoride form by treatment with fluorine at 200 to 500 C; and the purification of the uranium hexafluoride by distillation or adsorption/desorption on sodium fluoride. After laboratory experiments and the establishment of a pilot plant, an industrial-scale plant was built and successfully operated in 1962-1963. Three kg per hr of alloy are treated with a yield of HCl of about 50 percent and with a uranium loss in the zirconium tetrachloride of about 0.1 percent. The success of the plant led to the construction of another one which is capable of treating several kilograms of irradiated alloy. The essential features of the industrial-scale plant are shown in a flow diagram with a description of the process involved. Experiments showed that this process could be equally well applied to the treatment of uranium-aluminum alloys with yields of the same order as those obtained from uranium-zirconium alloys.

67-0893
Dust extraction at paper baling plant.
Public Cleansing, 57(10):561-562,
Oct. 1967.

To control the dust problem at a new paper baling plant, operated by the City of Westminster Cleansing Department, a wet deduster was installed. Rated at 12,000 cfm, the unit, in view of the light dust load, has a type D discharge, involving conical hoppers and quick release valves. The fan, on the clean air side of this unit, is powered by a 40-hp motor and passes cleaned air, via an acoustic-lined discharge duct, to the atmosphere. Incoming vehicles discharge paper into and adjacent to four chutes. Dust tends to rise at the bottom of these chutes and is controlled by canopy-type hoods. Working conditions have been materially improved by this deduster installation.

67-0894
Efficient disintegration of used tires.
Waste Trade World, 111(24):12-13,
Dec. 9, 1967.

The Palma process, which can handle 8,000 tons of waste tires per annum and costs slightly over £60,000, is described. It produces satisfactorily cleaned and sorted rubber crumb (72% of total product), textile threads (23%). and wire (5%). The tire is rotated against pairs of knives which separate and remove the beading containing the wire. Another pair of knives separates the running surface from the sidewalls, and the three rings are then sliced into pieces. A disc mill, which pulverizes the rubber, consists of three sections: a rough mill, which separates out small particles of rubber grain; a prismatic trommel, which isolates the cords without damaging the yarn; and a fine mill which completes the pulverizing process. Vibratory trays sort the rubber crumb which then falls into classification bins, each to be used for different reclamation purposes. Some reclamation uses include: production of high-grade rubber bitumens for the building industry, roads, and runways; mixing with a minimum amount of latex for an elastic carpet underlay; and spreading on normal paper to produce packing paper with high insulating qualities against moisture. The rayon and cotton cords can be used in the textile industry and the 40 percent that are damaged or short in length can be used as loose felting, quilted lining, stuffing, or sheet, or can be incorporated into sound and heat insulation boards for use in the building industry. A chemical process for handling nylon or polyamide is under development.

67-0895
Egan, H. N. Pelletizing fine coal
recovered from pumped refuse. Mining
Engineering, 19(11):73-75, Nov. 1967.

A new plant, built by Eastern Coal Corporation to pelletize fines into high quality coal pellets which meet the requirements of the metallurgical market, is described. A flowsheet of the water clarification, coal fines recovery, and coal pelletizing plant is given and its operation described. The processing plant effluent waters are pumped to the system via a distributor. The recovered and concentrated fines are discharged to a vacuum disc filter for dewatering and the filter cake is conveyed via a 100-ton capacity storage bin to a belt feeder that takes it through a mixer to a balling disc where the concentrate is shaped into pellets which are then conveyed by oscillating feeder to a tunnel-type dryer. The hardened and cooled pellets, which measure three-quarters by three-eighths in., contain less than 1.5 percent moisture, and have a stability equivalent to raw coal of the same size. The pellets are then discharged to car loading or storage at about 100 F. Initial problems, now being solved, include troubles with uniform flow of the filter cake out of the storage bin, with the pneumatic stoker, and with the heat drying of the pellets. The recovery of coal from a large refuse pond behind the dump is discussed.

67-0896
Eggen, A., and O. A. Powell. Feasibility
study of a new solid waste system
DUST/TR-6701. Hartford, Conn., University
of Hartford, Division of Urban Science
and Technology, Nov. 1967. 30 p.

A brief survey was made of Connecticut solid waste practices and costs. Enough experimental work was done to demonstrate the feasibility of a new system involving automobile shredding, burning of refuse and garbage, using the energy from the combustion process, and making a ceramic/metal composite by combining the molten solid products of combustion with shredded scrap. Performance estimates and a brief economic analysis and market survey were made. The power production cycle consists essentially of a shredded refuse burning gas turbine. The most important product families were based on the use of thin sheets of the ceramic on a rolled, shredded scrap mat. The production of ceramic foams and aggregate is also possible. It is estimated that the required development program will cost about $30 million and take four years to the first production solid waste system. It was concluded that the proposed system is feasible and has the potential of reducing waste disposal costs to nothing even if only energy production or only material production proves successful.

67-0897

Eggen, A., and O. A. Powell. The overall system; experimental results. In Feasibility study of a new solid waste system DUST/TR-6701. Harford, Conn., University of Hartford, Division of Urban Science and Technology, Nov. 1967. p.12-16.

The overall system postulated contains three separate sub-systems: automobile shredder, power production, and material production. Shredders are about the only technique now available which economically can produce a saleable scrap from automobiles. The power production system will be justified by purely economic considerations even if the by-product market provided by the material production system fails to materialize. It is unlikely that a municipality will object to delivering its refuse to a power generating system if this will reduce its disposal costs and problems to nothing. The power generating system postulated will serve 50,000 to 200,000 people and will be located in normal industrial areas so that refuse haul distances and corresponding collection costs will be minimized. The molten ceramic raw material, which can be produced by a high temperature incinerator, can be sold to the existing building products industry. The interrelationships of the three systems will be complex. The compressive and flexure strength of ceramic specimens were determined using residue from the Melt-Zit incinerator as the raw material. The residue had been water quenched from 3,000 F which produced a black glassy material.

67-0898

Eggen, A., and O. A. Powell. The auto shredder; Power production technology; power production economics. In Feasibility study of a new solid waste system DUST/TR-6701. Hartford, Conn., University of Hartford, Division of Urban Science and Technology, Nov. 1967. p.17-25.

Units capable of shredding a whole car cost about $2 million and are capable of handling 1,000 automobiles per day. Smaller shredders cost about $250,000 and have a capacity of about 75 autombiles per day. The components of the gas turbine power production system are two hammermills for refuse shredding, magnetic separators for the removal of ferrous material, silos for storage, scrap treatment zone, feed hopper, and burner/separator unit. The hot gases leaving the separator are returned to the turbine and the molten ceramic is fed into a well insulated storage/transport container for truck pick-up. Heat recovery from the hot (over 700 F) gas turbine exhaust gases is possible. The gas tubine, the shredder, and all the other materials handling and processing equipment will be controlled automatically. Supplementary remote viewing will be provided by closed circuit TV. The entire operation fits into a small area, approximately 100 ft by 200 ft. Manufacturer's data were used to estimate shredder, shredder installation, and installed gas turbine-generator costs. The cost of the burner/separator was assumed equal to 30 percent of the installed cost of the gas turbine-generator package. The net power generating cost depends on the price obtained for the system by-products-molten ceramic and steel scrap.

67-0899

Eggen, A., and O. A. Powell. Material technology; material economics; the development program; the economic potential. In Feasibility study of a new solid waste system DUST/TR-6701. Hartford, Conn., University of Hartford, Division of Urban Science and Technology, Nov. 1967. p.26-30.

The two possible products are a thin steel/ceramic composite sheet and a ceramic foam. Another product of interest is a poured-in-place ceramic. This would provide a very large, although relatively low-priced, market for the ceramic. Aggregate was included as a product because it can be produced with an absolute minimum of investment in hardware or technology development. The development program initially will concentrate on obtaining the properties of the solid waste ceramic. The processing cost for composite sheet production was estimated at a little over 2¢ per sq ft. Without the power production system, the molten ceramic must be produced in a high-temperature incinerator at a cost of $6 per ton of refuse or $40 per ton of ceramic. The total development program is estimated to cost $30,000,000, which includes a facility allowance of $10,000,000. The average savings were calculated to be $2.50 per year for each person from an investment of $5 per year per person. The power contribution comes to $2.80 per ton of refuse, while the building materials add $6.10 per ton. Thus the municipalities, rather than paying to dispose of refuse, could conceivably sell their refuse for $7.00 per ton.

67-0900

Electricity from waste. Waste Trade World, 110(17):4, Apr. 19, 1967.

The construction of a residual plant which handles both ferrous and nonferrous metals, as well as clinker, in one of the largest refuse disposal plants, is described. The works will handle 1,680 tons of refuse a day and their incineration will produce power to generate between 27 MW and 40 MW electricity for sale. After all combustible substances have been burnt out in the boiler house, the residuals will be transferred by conveyors to the handling plant to separate and store the classified materials. Residuals will be delivered to a coarse vibrating screen which will separate out large items into a concrete hopper. Ferrous metals will be extracted from the hopper by an overhead magnetic crane and transferred to an automatic baling machine. Smaller residuals will be conveyed to a rotary breaker machine in which the clinker will be reduced in size by gravity breaking. Clinker and fine ash are then conveyed to storage hoppers for subsequent disposal. Any unbreakable items will discharge onto the clinker conveyor where a magnetic separator will extract any remaining ferrous material and discharge it onto the appropriate hopper for transfer to the baling machine. Ferrous metal bales are fed by a discharge conveyor to loading points for road transport.

67-0901

Engel, W. F. Nevada initiates junkyard screening. Public Works, 98(3):133, Mar. 1967

Since Nevada, like the other 49 states, is obligated under Title II of the Beautification Act of 1965 to screen junkyards located within 1,000 ft of the right-of-way of highways on the Interstate and Primary systems and visible from the main traveled way by January 1, 1968, or relocate by January 1, 1970, a pilot project in junkyard screening was undertaken by the Nevada Department of Highways and completed on September 29, 1966. This project involved an auto salvage yard, 200 ft wide and 950 ft long, in a zoned industrial area approximately 6 miles northeast of Las Vegas. A proposal was submitted to the BPR for federal participation. In May, approval was received to proceed with Stage 2 (design and right-of-way acquisition). The job was advertised, and the contract was awarded for $9,370. The contract, which was completed within 20 working days, screened the auto salvage yard with a 7-foot high aluminum latticed chain-link fence on three sides. Including preliminary engineering, right-of-way, and construction, the project cost approximately $15,000; the State's share was 25 percent of the total. From this first job engineers gained experience in designing and establishing specifications for such a contract; right of way and utility agents became acquainted with the property problems involved; and the Department lawyers achieved initial competency in preparing the legal documents required.

67-0902

Erythropel, H. Ashes and slags. Brennstoff-Waerme-Kraft, 19(4):197-199, Apr. 1967.

A report on the present state of technology of the utilization of ash and slag is presented. The bibliographic references comprise 32 titles. In two tables the production of ash and its utilization in the major industrial countries is listed. For example, in 1965, the United States produced 20 million tons of ash and utilized 6 percent of it. The respective figures for West Germany are 10 million tons and 27 percent. Ash is mostly used for concrete and for road construction. (Text-German)

67-0903

Especially for stacking. Waste Trade World, 3(10):10-12, Sept. 1967.

The new 40,000 depot at Byker, Newcastle upon Tyne, of W. F. and J. R. Shepherd is described with special emphasis on stacking space, because of the industrial type of scrap to be handled. A sketch of the exterior of the building shows the exterior location of the main offices to save stacking space inside the building. A plan of the warehouse shows location of the equipment calculated to save wall space for stacking of material. A photograph is shown of the S 110B Hyster fork for handling the 60 to 70 different types of non-ferrous metals stocked. This fork lift has a capacity of 5 tons, derated to 2½ tons when extended to 23 ft. A photograph is included of the fork lift stacking material against the wall. There is also an exploded diagram shown of the Avery Austria weighbridge with a 40-ft by 10-ft platform and calibrated to the nearest pounds spread over a range of 40 tons. This weighbridge can accommodate even the largest vehicles without any need to uncouple. The ancillary equipment is placed to save wall space without regard to creating an easy flow of material. The baling press on the far side of the weighbridge against the outside wall, is located in an unsuitable corner for stacking purposes. The outside office has large glass windows so that the operations in the plant can be observed. Because some of the non-ferrous metals are almost in the semi-precious range, a roller shutter door is controlled from the general office with a direct alarm to the police.

67-0904

Evaluating industrial tips. Waste Trade World, 110(4):4, Jan. 28, 1967.

At a recent meeting of the Sheffield and District Group of the National Industrial Salvage and Recovery Association, Mr. George Darling, M.P. (Minister of State, Board of Trade) suggested a plan for teams of retired experts, such as mine surveyors and chemical engineers, to assay the contents of industrial waste heaps throughout Great Britain. The task of getting rid of dumps could be greatly eased if it could be shown that they contain materials which have some commercial value and are worth reclaiming. The experts would assay the contents of all dumps in their particular area and their knowledge could be used to investigate the materials and to suggest suitable ways of reclamation. The idea could also be put into operation in steelworks and engineering factories, where high value materials are quite often dumped as scrap. Obstacles, such as ownership of large dumps, exist, but a working party of the Northern Region Planning Committee is investigating the suggestion.

67-0905

Feller, M. Dust collected in cyclones as filler in bituminous mixtures. Bitumen, Teere, Asphalte, Peche und Verwandte Stoffe, 18(11):444-447, Nov. 1967.

In the production of bituminous mixtures, dust accumulates in the cyclones which must be either eliminated or prepared for reuse. After a brief explanation of the functioning of a cyclone, the various possibilities of reusing the dust collected there are discussed. The dust can be either returned automatically to the bituminous mixture or it can be passed to a storage bin from where a certain amount is mixed with some other filler material and added to the bituminous mixture. A third possibility would be to exclude the dust from further utilization. This will be the case when the dust is composed mainly of hygroscopic particles such as clay. Dust mixed with some other material proved to be a better filler material than dust alone. For any filler material the water contents, the amount of incineration residues, and the grain size distribution must be determined prior to use. The three test methods are briefly discussed and diagrams plotting the grain size distribution of various dusts are given. Tests measuring the behavior of the bitumen/filler mixture were conducted; the softening point vs. binding agent/filler ratio was measured, the influence of the filler material on the amount of binding agent and on the stability of the mixture was determined, and the decrease in stability after storage under water was observed. The results show that the softening point increases with increasing contents of incineration residues, whereas the stability decreases with increasing contents of incineration residues. Tests concerning the stability are not yet terminated but initial stability test results indicate that an amount of 2.5 percent by weight of incineration residues in the filler material is still acceptable for bituminous concrete mixtures. (Text-German)

67-0906

Fluid power in scrap and waste disposal. Fluid Power International, 32(377):58, 61, Aug. 1967.

The exhibits at the Scrap and Waste Exhibition at Olympia, London, in July 1967, covered a wide range from refuse dumping vehicles and machines with cactus grabs for lifting abandoned cars to a trough-like machine for conveying light scrap on a cushion of air and involved in many cases the use of hydraulics or pneumatics. The Hugh Haul of Telehoist Ltd. is illustrated with its demountable body-styled container system for the efficient handling of scrap, waste, and bulk materials in large volumes with gross payloads of 13 1/2 tons and containers of 10 to 40 cu yd capacity. The basis of its hydraulic system is a Webster pump supplied by Tektro, which delivers 40 gal per minute at up to 2,500 psi. Also illustrated is an Eldair 300-ton scrap-shearing machine, exhibited by George Cohen Machinery, with a hold down capacity of 100 tons and a shearing force of 300 tons. It can handle all types of scrap metal including 2-in. flat sections and 3½-in. diameter bars. The machine is powered by a 50-hp electric motor and the main hydraulic power comes from a Towler in-line pump with a pressure of 4,500 psi and a delivery of 15 gal per minute. Also illustrated is the Poclain TY45 hydraulic crane fitted with a six-tine grab and a hydraulic system with a three-piston pump operating at 1,500 rpm, with a delivery rate of 8.8 gpm at 4,300 psi. Among the pneumatically operated machines were three Nupress baling presses.

67-0907

Franus, R. Utilization of waste sludges of coking coals in gas manufacture. Gaz, Woda I Technike Sanitarna, 41(12):398-402, Dec. 1967.

Poland's long-range plans stipulate the cessation of coal carbonization for gas manufacture in large plants by 1975, while small plants, scheduled to operate another 15 to 20 years, are urged to lower their costs. At present, the government is subsidizing gas manufacture, depending on the size of the plant, at a rate of 266 or 300 zloty per 1,000 cu m of gas. Tests at a pilot plant in Radom have proven that lower grade coals or coal sludge can be used in the retort mix instead of the expensive Type 30 coking coal with a resulting profit of 40 or 44 zloty. Slimes used were those obtained in the course of wet beneficiation of coking coals. Grains did not exceed 3 mm, with the bulk falling below 0.5 mm. The sludge contained particles of silts and schists, as well as 25 percent water. The suggested technology presupposes a retort charge consisting of alternating layers of coking coal sludges (up to 3 mm in diameter) and graded coal. While on the conveyer, the sludge is to be treated with a 5 percent tar and water emulsifier in order to agglomerate coal particles. Gas obtained by adding sludges has better heating properties (increase in hydrogen and heavy hydrocarbon) and less toxicity (lower carbon monoxide level); full composition is given in Tables 7 and 9. Poland produces 2,100 tons of coking coal sludge daily, which would cover the needs of the gas industry, assuming a 50 percent sludge content in the charge. (Text-Polish)

67-0908

Freed, V. H. Chemical transformation of solid wastes; progress report, Oct. 1, 1966-Dec. 31, 1967. Corvallis, Oregon State University Department of Agricultural Chemistry, 1967. 62 p.

Preliminary work done on the problems of chemical transformation of solid wastes has helped to identify the chemical nature of the constituents of solid wastes and some of the reactions which these materials undergo. The overall goal is to study the feasibility of chemical transformation of solid wastes into products of economic value and for the reduction of the waste volume for ease of handling. The constituents of municipal solid waste, straw, and bark are discussed and data describing their reactions are presented. The chemical nature of cellulose and the potential market for extracted cellulose and its derivatives is reviewed. The current status of a study of the products of high-pressure hydrogenation of straw and the potential uses of solid waste materials are given. Results of these studies indicate that there are a vast number of potential chemical transformation reactions available for the processing of solid waste to produce bulk reduction, air and water pollution abatement, and conversion to useful products. (U.S. Public Service grant UI 00510)

67-0909

Freed, V. H. Progress report on chemical nature and reactions with straw. In Chemical transformation of solid wastes; progress report, October 1, 1966-December 31, 1967. pt.1. Corvallis, Oregon State University Department of Agricultural Chemistry, 1967.

Straws from several sources contain varying proportions of the same major constituents: alpha-cellulose, lignin, pentosans, water soluble components, and ash. The ash content of wheat straw is higher than rye or oat straws but lower than rice straw. A sample of wheat straw was taken from a farm south of Philomath, Oregon, and finely ground for ease of handling and to facilitate the completion of chemical action. The straw was subjected to solvent extraction and xanthate extraction; treatment with hydrochloric, nitric and sulfuric acids; and destructive distillation. The water content was determined by drying for 24 hr at 100 C. Straw was found to contain a small quantity of solvent extractables, about 10 percent was soluble in hot water and ethanol. Assuming a 10 percent loss during processing, it is possible that cellulose extraction could amount to about 40 percent of the straw weight. The residue is probably composed of lignins, pentosans, and ash. Procedures and results are given for hydrochloric acid treatment, xanthate extraction, nitric acid treatment, and sulphuric acid treatment. Destructive distillation of straw has not been evaluated as yet.

67-0910

Freed, V. H. Progress report on the chemical nature and transformation reactions of bark dust. In Chemical transformation of solid wastes; progress report, Oct. 1, 1966-Dec. 31, 1967. pt.2. Corvallis, Oregon State University Department of Agricultural Chemistry, 1967.

Bark can normally be mechanically separated into cork, bast fibers, and amorphous powder. Each of these components contain varying percentages of solvent extractables (25%), cellulose (40%), the lignins (34%), and ash (1%). The solvents usually used to extract components from the bark were: hexane, ether, hot water, and alcohol. Soluble waxes from bark have limitations for direct industrial use, but it is reported that the market potential of refined wax is good. Dihydroquercetin, a material with antioxidant properties extracted from barks with diethyl ether, is useful in preventing rancidity in foods. Tannin, which has been evaluated as an acceptable replacement for quebracho tannin in the leather industry, can be dissolved by hot water, as can carbohydrates such as pentose, galactose, mannose, uronic acid, and glucose. Alcohol can be used to extract 8 percent phlobaphene and tannin from ponderosa pine bark. The alkaline nitrobenzene oxidation of bark phenolic acids produced about 1.6 percent vanillin. Analysis of lignin showed the presence of 11-hydroxy lauricacid, hydroxy palmitic acid, unsaturated hydroxy acids, glycerol, and a phenolic acid material. The amorphous powder from douglas fir bark contains about 35 percent extractives, 50 percent lignin, and 15 percent holocellulose. Procedures and results are given for destructive distillation, xanthate extraction, cellulose acetate extraction, acid and base hydrolysis, chemical reductions, high pressure hydrogenation, and nitration of bark dusts.

67-0911

Freed, V. H. The chemical nature and reactions of solid waste. In Chemical transformation of solid wastes; progress report, Oct. 1, 1966-Dec. 31, 1967. pt.3. Corvallis, Oregon State University Department of Agricultural Chemistry, 1967.

Solid waste is defined as the garbage and refuse that is picked up in garbage cans from homes in a city. Pelletized, composted samples of municipal refuse were subjected to nitrogen and phosphorus enrichment, destructive distillation, nitration, and solvent extraction. The addition of ammonium nitrate and ammonium phosphate was successful, but the addition of aqueous ammonia did not increase nitrogen content of solid waste. The phosphorus content of solid waste was found to be 0.4 percent. Chemically uniting phosphorus with the ingredients of solid waste was successful, increasing the phosphorus content to 1.34 percent.

Destructive distillation of the organic matter of solid waste yields about 15 percent noncondensible gas, about 15 percent condensible vapor, and about 70 percent residue. When heated at 600 C in air, the residue was reduced by about half. That remaining was ash. Solid waste was treated with a mixture of sulphuric acid and nitric acid in order to nitrify the cellulose present. The product was readily combustible but left a considerable amount of ash. The cellulose from solid waste has been extracted by dissolution of base soluble cellulose xanthate followed by precipitation of the cellulose by neutralization. Nitration of this product should produce a cellulose nitrate of reasonable purity. A complete solvent extraction analysis is given.

67-0912

Freed, V. H. A report on progress in determining markets and uses for cellulose. In Chemical transformation of solid wastes; progress report, Oct. 1, 1966-Dec. 31, 1967. pt.4. Corvallis, Oregon State University Department of Agricultural Chemistry, 1967.

The three major uses of cellulose take advantage of the strength and toughness of the naturally occurring fiber (cemented with lignin in wood, twisted and woven together in textiles, matted and adhering to one another in paper) while other uses take advantage of the chemical properties (production of cellophane, rayon, acetate films, plastics, and derivatives). Potential uses of cellulose extracted from solid wastes are classified into the following categories: whole cellulose, cellulose ethers, cellulose esters, cellulose grafts, cellulose crosslinks, and cellulose degradation products. Whole cellulose is used in such areas as foods, packaging, and nursery applications. Cellulose ethers are used in chromatographic separations, special paper making, semi-permanent textile sizing, foods, paints, cosmetics, synthetic detergents, paint removers, plastic, and surface coatings. Cellulose esters include cellulose nitrate (used primarily in the lacquer industry), cellulose acetate used for yarn and plastic compositions, and cellulose xanthate used in the production of rayon, cellophane, and plastic. A new way to combine polyethylene plastic directly on cellulose fiber has been demonstrated. Crosslinking agents have been used to change the character and usefulness of cellulose. Some of the by-products of cellulose degradation are: levulinic acid, and ethyl alcohol.

67-0913

Freed, V. H. Hydrogenation of cellulose. In Chemical transformation of solid wastes; progress report, Oct. 1, 1966-Dec. 31, 1967. pt.5. Corvallis, Oregon State University Department of Agricultural Chemistry, 1967.

The products of hydrogenation of cellulose are alcohols, polyalcohols, a solid residue, and a fixed gas composed of carbon dioxide and methane. A series of hydrogenations of wheat straw were undertaken to find the effect of varying temperature, reaction time and hydrogen pressure. All runs were made using 50 g of finely ground wheat straw containing about 8 percent adsorbed water. The residue left from the 200 C run was 58 percent by weight of the original straw and appeared to be carbonized straw. Only 0.4 percent tar was formed. At 285 C there was produced a mixture of solid tar and liquidous oil. At 345 C, and 2-hour reaction time, an orange-brown oil with a green fluorescense was formed. At 350 C and 5-hr reaction time, the oil was lighter in color and had an odor like light machine oil or kerosene, however there was appreciably less yield. From the percentage yields of materials and number of compounds indicated by the gas chromatographic study of the oils, it appears that the optimum temperature must lie between 300 to 350 C, with a reaction time of 5 hr decreasing to 2 hr with increasing temperature. Some loss from the original straw weight could be accounted for in the water present, the conversion of molecular oxygen to water, and the inorganic material in the straw. There are several limitations to this present procedure: high pressure, the corrosive nature of the catalyst, and the need to increase the yield.

67-0914

Freed, V. H. Potential uses of solid wastes. In Chemical transformation of solid wastes; progress report, Oct. 1, 1966-Dec. 31, 1967. pt.6. Corvallis, Oregon State University Department of Agricultural Chemistry, 1967.

A summary of potential uses of solid waste materials indicates the broad range of potential applications for these materials through component separation, chemical addition, and chemical transformation. Straw can be treated with aqueous ammonia to produce an ammonium acetate moiety which remains absorbed on the straw. This material can be used as a cattle feed. Straw can also be treated to produce furfural and has a heating value of from 5,000 to 6,500 Btu per lb. Wheat, rice, oat, barley, and straw have been evaluated as a source of pulp for paper production; and wheat, straw, and red mace have been used to make good insulating boards and accoustical tile. Straw has also proved to be of value as a soil conditioner and a raw material for the extraction of cellulose and lignins. Bark dust could be used for the extraction of organic solvent soluble waxes, tannin, dihydroquercetin, cellulose and lignins, and pentosan. The fiber component of bark dust has been suggested as a potential component in insulation, filters, hats, cement, asphalt fillers, and fertilizers. Bark dust treated with nitric acid, urea, and ammonium phosphate has found acceptance as a soil mulch; Douglas fir bark cork has been used in the production of floor tile; bark powder is used in the adhesives and plastic molding industries; and fatty acids extracted from bark dust could find utilization in cosmetic and lubricant industries. Solid waste is well suited for use in the soil, and could serve as a source of metals, cellulose, and, following destructive distillation, finely divided carbon.

67-0915

Fuchs 301 mobile cranes. Waste Trade World, 110(9):14-15, Mar. 4, 1967.

The criticism made of a brand of strut jib mobile cranes in a previous issue of this Journal was not meant to apply to the range of Fuchs cranes being sold by Vanesco Ltd., Surrey, England. There are now over 200 Fuchs 301 cranes in operation in the scrap metal trade throughout Britain. The Fuchs 301 is a mobile crane with a lifting capacity of 4 tons 2 cwt at a 9-ft 2-in. radius with a 23-ft lattice jib. The crane is fitted with a four-speed gearbox which allows for a wide selection of working speeds on all movements. It has exceptionally high stability and maneuverability in confined spaces and, with the aid of a floating front axle, can travel over rough terrain or through heavy site conditions. The floating axle can be locked mechanically or hydraulically when lifting its maximum load. Other features of the crane which are described include a mechanical tagline in conjunction with a magnet or grab, a folding jib, and hydraulic brakes. The basic design of the crane is simple and therefore requires no complicated servicing or repairs.

67-0916

Fuel savings, byproduct sales are aims in utilizing waste. Wood and Wood Products, 72(12):52, 56, Dec. 1967.

Better ways of utilizing the large amounts of waste generated by wood industry plants are continually sought. Three operations involved in such use are described. The first is a new automatic fuel handling system and steam plant that turns sawdust and shavings into an estimated $65,000 annual saving on natural gas. Additional benefits are a clear atmosphere around the plant and a growing local market for excess sawdust. The second operation involves mechanization as the key to a profitable chip-making business with the mill geared to process 7 million cords annually. The equipment and process are described. The third operation involves injecting molding presses to increase production of wood-plastic products.

67-0917

Garbage and scrap processing plants from Japan. Public Cleansing, 6(7):359-361, July 1967.

A garbage compaction plant, designed and patented by the Tezuka Company Ltd., Tokyo, compresses domestic and industrial waste in powerful hydraulic presses. It then automatically wraps the compressed bales in air-tight wire mesh vinyl film. The processed refuse is reduced to one-fifth the original volume. The bales can be made heavy enough to sink at sea. Because they are solid, dehydrated, and air-tight, the bales eliminate nuisances when used for land reclamation. The Tezuka Company has also developed a 'Car Barbecue Plant' that reduces scrap cars into bales of pure iron. The car is charged and rotated inside a furnace where the non-ferrous metals are burnt or melted and separated by the difference of melting temperatures. What is left of the car is put on the trolley and dropped into the shear press where it is reduced to a bale of high purity iron. It claims that 100 cars can be processed in an 8-hr operation.

67-0918

Getting rare metals out of scrap. New Scientist, 36(568):206, Oct. 26, 1967.

Scrap from high temperature alloys, which contain valuable elements such as molybdenum, niobiam, cobalt, and chromium, has not been reclaimed because of the expense involved in dealing with small quantities of metals that have been especially developed to resist high temperatures. However, in Britain, many of the elements are expensive and have to be imported, so that recovery would be an attractive proposition. Recently the Warren Spring Laboratory at Stevenage has been working on a chemical processing technique which has proved successful. The details of the process have not yet been revealed, but a prototype industrial extraction plant is now under way. Apparently the road is also open for variations of the process which might be used on the liquors and sludges that come from electrochemical machining, a comparatively new process in industry that is particularly valuable for making parts from complex and expensive alloys.

67-0919

Ghosh, A. K., and S. C. Sen Gupta. Reclamation of lac wax from lac effluents. Research and Industry, 12(3):168-171, July-Sept. 1967.

A study of recovery of lac wax from sludge obtained by the treatment of waste effluents with sulfuric acid, is reported. The sludge, obtained by the precipitation of lac factory waste effluents with sulfuric acid, contains about 8 to 10 percent wax. Studies suggested that the best method for recovering the wax from the sludge involved soxhlet extraction with commercial hexane. Preliminary experiments in a pilot plant with industrial soxhlet extractors showed that over 90 percent of the wax could be extracted smoothly with commercial hexane. The process was then standardized in further experiments, with ten extractions found to be optimum. The acid value of the reclaimed wax was somewhat higher than that of the commercial sample, so it was brought down within the desirable range by boiling for 30 minutes in water containing 2 parts sodium carbonate per 100 parts of wax. The properties of this wax were determined and compared with those of commercial lac wax with results given by table. Its properties were found to be similar except for its inferior penetration value and hardness. It has been found satisfactory in the preparation of wax polishes. A breakdown of cost estimates for the total process is given with a 25 percent annual return on investment. It is estimated that it would be possible to recover 200 to 250 tons of wax per year in India, valued at about Rs 16.0 to 20.0 lakhs at Rs 8.0 per kg.

67-0920

Ghosh, A. K., and S. C. Sen Gupta. Utilization of byproducts of lac industry; pt.1. Manufacture of bleached lac from molamma. Research and Industry, 12(3):171-174, July-Sept. 1967.

A method for converting molamma, a by-product of the lac industry, into bleached lac is reported. Molamma is obtained during the processing of sticklac in the form of fine grains and dust which contain about 75 percent lac along with impurities such as sand, woody material, and insect debris. The conventional alkali extraction process for seedlac required modification in order to reduce the dissolution of the undesirable materials, particularly insect debris, during extraction. The process which was developed involves initial screening, preparation of a solution of sodium carbonate and water which is heated to 55 C, addition of raw material with constant stirring for 4 hr, and addition of hot water to maintain a temperature of 50 C and to obtain a solution of 25 percent lac. The solution is then strained through cloth with further processing such as bleaching, precipitation, and washing carried out by the already standardized method. Bleaching of molamma by this technique has been repeated on a semi-pilot scale a number of times and found to be reproducible. The yield of bleached lac is 80 to 83 percent based on the lac content. The comparative properties of bleached lacs prepared from molamma and from seedlac under different conditions of extraction are presented in a table. Another table compares molamma and seedlac for wax and ash contents and life under heat of refined and regular bleached lac prepared by the modified method. It was found that bleached lac obtained from molamma is comparable to that obtained from seedlac and of better storage quality. The new method can also be used for seedlac.

67-0921

Golueke, C. G., and P. H. McGauhey. Biological fractionation of organic wastes. In Comprehensive studies of solid wastes management; first annual report. Sanitary Engineering Research Laboratory Report No. 67-7. Berkeley, University of California, May 1967. p.161-166.

Reports in the literature amply prove that groups of bacteria exist in nature which can rapidly decompose cellulose under conditions that have been defined and hence can be incorporated into practical processes, among which could be one for waste treatment. Such a process would yield only a minimum amount of offensive gases (which could be easily controlled), and the amount of solid residue from the cellulosic fractions would be quite small. The strong possibility exists that useful products can be obtained with the process in operation and that these could prove important in offsetting the cost of the treatment. Enough is known about the metabolic processes of the cellulose decomposers to enable predicting the metabolic products under given conditions. These products include certain substances such as glucose and organic acids (e.g.: butyric, succinic, propionic, acetic, and formic). From a literature search, three classes of organisms were selected, and basic handling and culturing studies begun. When the optimum growth conditions are found, plans will be made for a pilot-scale plant operation for the continuous fermentation of cellulose.

67-0922

Government measures offer cold comfort. Waste Trade World, 111(12):3-4, Sept. 9, 1967.

The relaxation of credit restrictions by the British Government, by allowing a decrease in the initial payment on installment buying and increasing the period for repayment, is not expected to benefit the scrap and waste industry with new business. The down payments for installment buying have been reduced from 30 to 25 percent for automobiles and from 33.33 to 25 percent for washing machines, refrigerators, and similar goods. Statisticians indicate that relaxation of credit restrictions will not result in an increase in the outstanding installment debt of £100 million of which £20 million would be for interest. Taking the motor industry where scrap consumption is considerable, it was indicated if the remaining £80 million were all spent on new cars at £600 a car, there would be an increase of 130,000 cars. The 175,000 tons of steel for these new cars would only require 43,000 tons of scrap. The demand by car manufacturers for such items as car doors is very small, but the increased demand for waste paper required for cartons and wrappings for items qualifying for the reduction in initial payment would be even more negligible. The idea is presented that the effects are intended to be psychological to give aid to the motor industry, a traditional barometer of British economy. It was also suggested that the announcement was an appeasement move directed toward the Trades Union Congress. The scrap and waste industry should prepare for hard times.

67-0923

Harrop, J. A., B. E. Messent, and M. G. Cantle. A scheme for pumping a slurry of iron oxide. Steel Times, 195(5179):485-491, Nov. 1967.

An automatic pumping system for the transfer of an iron oxide slurry from a wet gas cleaning plant, which removes the fume from an Oberhausen furnace, back into the iron-making cycle at the sinter plant, is described. The slurry pumping operation is a relatively enclosed system to insure that the iron oxide is not redistributed into the atmosphere and onto the ground. The plant description includes details of the rotor plant, the pipeline, and the sinter plant, with flow diagrams. In a section on plant design, the guidelines that were used to establish working sizes and flows for the various components in the system, including an assessment of slurry and of potential slurry consumption, are summarized. Instrumentation, control, and operation of the system are discussed and data on operating experience during the first three months of continuous operation are given. In 10 weeks there were 505 oxygen blows on the rotor furnace with 2.8 tons of solids transferred for every oxygen blow. Approximate figures for the capital cost of the slurry pumping plant are itemized, with a total cost of £14,000. Since the operating and maintenance costs are low, the plant should pay for itself in a few years. It was concluded that to date the system is delivering solids to the sinter plant at a rate equal to production by the rotor plant in an automatic and largely trouble-free manner.

67-0924

Hershkovitz, S. Z., and A. Feinmesser. Utilization of sewage for agricultural purposes. Water and Sewage Works, 114(5):181-184, May 1967.

The utilization of sewage for agricultural purposes in Israel is discussed. Since Israel is a country with an acute water shortage, the re-utilization of sewage is included as part of the water potential in Israel and is estimated at about 40 billion gal per annum, or about 10 percent of the total potential of the country. In addition, the efficient use of sewage for irrigation can increase crop yields both qualitatively and quantitatively due to the fertilizer present in the sewage, and it is an inexpensive and efficient solution to the problem of sanitary disposal that might otherwise be caused by sewage. After suitable purification in oxidation ponds, which are the most suitable purification means in Israel, it is technically possible to irrigate with sewage as with any other water, providing the crops are suitable from the sanitary point of view (forage and seed crops, not lettuce). An additional advantage is that the organic material in sewage improves soil structure. While sewage contains fertilizers, it also tends to contain more soluble salts than ordinary water, thus reducing somewhat its value as irrigation water. Industrial wastes, in particular, may contain materials harmful to agriculture, such as heavy metal, and should therefore be treated or separated from innocuous sewage.

67-0925

Hoskins, F. H. Development of acceptable and nutritious foods from single cell and yeast proteins. In The development of food from cellulosic waste for human and animal consumption. Baton Rouge, Department of Chemical Engineering, Louisiana State University, July 1967. p.39-47.

The most comprehensive efforts to produce new food items from agricultural by-products have been of microbiological origin. The products most often investigated have included: skim-milk, cottonseed meal, soybean meal, butterfat, cottonseed oil, and molasses. The majority of agricultural materials studied in this aspect have been those of high monetary value, rather than those of cellulosic nature. The overall aim of this research is to produce proteins in commercially feasible quantities using these agricultural by-products as substrate energy-sources. Specific aims are: to study methods of utilization of agricultural by-products to obtain nutrients other than protein suitable for inclusion into new food items; to formulate a nutritionally sound and acceptable food product based on single-cell and yeast proteins; to study the effect of various methods of preservation, packaging and preparation on the nutritional value of these products; to evaluate the nutritional and metabolic utilization and assimilation of newly developed foodstuffs; to conduct organoleptic evaluations and consumer acceptance studies; and to make design studies of synthetic food production plants for various world locations.

67-0926

Hot metal for the electric furnace. Iron Age, 200(26):19, Dec. 28, 1967.

An electric furnace which feeds on scrap and which takes 50 percent (and up to 75%) hot metal is described. Studies are being done on the furnace at the new Kaiser-engineered electric furnace shop in Houston. The manager, W. M. Rankin, comments that there have been extended periods of production in the area of 70 net tons per hr using the 50 percent hot metal practice, and tests have been conducted using percentages up to 75 percent with encouraging results. The overall effects of such a high percentage of hot metal on furnace refractories will have to be determined under continuous operation. Tapping 200 net ton heats under cold charge conditions is being studied. While further development is needed, there is optimism about the ability of the shop to produce at high rates over a wide range of operating practices as dictated by economics and hot metal availability. Values for various parameters under cold charge, 35 percent hot metal, and 50 percent hot metal practice, are tabulated.

67-0927

Houses built from rice waste. Science Journal, 3(11):22, Nov. 1967.

The first building to be constructed from bricks with rice husks as the main constituent will be erected in Britain sometime in 1968. Behind this development is the Tropical Products Institute, London, which for the past few years has been concentrating increasingly on projects to utilize waste products of tropical agriculture. Initially, bricks developed from rice husks suffered two drawbacks: they could not be employed for load-bearing parts, and they absorbed too much cement. However, these problems have now been overcome. The substitution of hydraulic pressure for atmospheric pressure in producing the bricks made them suitable for load-bearing parts such as beams, lintels, and door frames. In addition, the cement content was radically reduced, with the possibility of bringing it down to perhaps half that of the original concept. It is estimated that an outfit to produce these bricks would cost around ₤500, since all that is required is a small hydraulic press, a dryer, and the electricity necessary to run it.

67-0928

Human waste as rocket fuel. Compost Science, 7(3):12, Winter 1967.

A system of oxidizing all the waste products of a spaceship crew, adding to it a metal powder, and using the mixture as fuel for rockets of low power, is being developed by the Rocket Research Corporation, Seattle. This idea both saves fuel and sterilizes the waste product.

67-0929

Hungarian waste leather plant. Waste Trade World, 111(6):5, Aug. 5, 1967.

In Hungary a number of small existing leather waste processing plants are to be replaced by a major plant with a daily output of 4 to 5 tons. Chemokomplex awarded the contract for the $500,000 plant to Saifecs of Italy from a number of bids submitted by West European countries. The waste is granulated and mixed with water to form a suspension which is filtered through a series of screens, and dried by vacuum, compressed, and finally cut. The portion to be processed into raw material for fancy leather goods is dyed separately. The plant, which is scheduled to start production at the end of 1967, is to be located adjacent to a leather factory in Pecs. Other buildings and ancillary plants will be designed and built in Hungary. Working with the factory, the processing plant will produce linings, insides, stiffeners, and raw materials for fancy goods.

67-0930

Hungary saves ₤30 million. Waste Trade World, 110(11):4, Mar. 18, 1967.

Hungary's national scrap dealing company, M E H (scrap collecting and by-product utilization company), collected a record ₤30,000,000 worth of scrap in 1966--₤3,000,000 worth more than the year before. It is estimated that its reutilization saved the country ₤26,000,000 in imports. Scrap collected included more than 215,000 tons of iron and other metals, 7,000 tons of bones for use as artificial fertilizer, and 8,500 tons of fireclay chippings. More than 24,000 tons of textile waste were collected, mostly for use as machine cleaning rags. Glass factories were supplied with 16,000 tons of broken glass, once exported because factories had no means of making use of it. This was the first year in which home industry could utilize such scrap. Pelts collected included 330,000 sheep skins, 100,000 lamb skins, 600,000 rabbit and hare skins, and large quantities of the more valuable hamster and musk furs. Human hair, collected almost exclusively for hard currency exports from the country's hair-dressers, yielded 236 tons. Some of the scrap collected was resold for use in its original state, including 51,000 tons of iron and 33,000 tons of rejects from metal factories which were sold in 1966 to co-operatives, small craftsmen, and do-it-yourself experts. Objects made of valuable metal alloys were selected and sold for technical use. The company has also set up a number of secondhand shops in Budapest, specializing in metalware, paper, etc. It sold more than £600,000 of goods in 1966.

67-0931

Instrumentation for metal recovery from waste. Mining Journal, 269(6882):26, July 14, 1967.

This is a review of a paper presented at the International Tin Council describing the use of a new gravity concentrator in assisting the recovery of tin concentrates from discarded waste. The tin content of the concentrated material is determined using an isotope fluorescope analysis. The instrument used weighs less than 20 lb and uses a low-yield radioactive isotope 1 cm in diameter rather than an X-ray tube. It is being used effectively in the analysis of other ores such as copper, lead, zinc, manganese, molybdenum, niobium, zirconium, and barium. It may also be used in the analysis of the iron content of slag from steel manufacture.

67-0932

Islam, M. A. High grade dissolving pulp from bagasse by the kraft process. Science and Industry, 5(3):442-446, July 1967.

Due to the lack of conventional raw materials, such as soft wood, in the country, bagasse has become an alternative raw material for pulp making. Its use by the paper industry has been a commercial success in the Latin American countries as well as in the Caribbean Islands. Both large and medium-sized mills have been set up in these countries. In India, a few mills have started using bagasse in small proportion for pulp production in conjunction with such conventional raw materials such as bamboo, soft wood, etc. The composition of bagasse makes it difficult to make good quality pulp without removing pith from it. However, because of its high pentosan content, the bagasse can still yield a high grade pulp. High grade dissolving pulp has been made from bagasse which may be used for the manufacture of rayon and other cellusose derivatives. The process consists of depithing the bagasse, digesting of the depithed bagasse with a mixture of sodium hydroxide and sodium sulphide, and the multistage bleaching of the pulp followed by cold alkali extraction. The resulting pulp has been found to be brighter than on any previously reported bagasse pulp. The process is described and supporting data are furnished.

67-0933

Jacobson, A. R. Utilization of sewage for agricultural purposes. Public Works, 98(8):150, Aug. 1967.

The use of sewage for irrigation in an efficient manner is based upon the following reasons: re-utilization of an additional source of water; utilization of the fertilizers present in the sewage; inexpensive and efficient solution of the problems of sanitary disposal; and prevention of possible sanitary nuisances that might otherwise be caused by the sewage. In Israel, use of sewage for irrigation is estimated to provide about 40 billion gal per year, or about 10 percent of the total potential of that country. Oxidation ponds are the most suitable purification means in Israel because of the arid climate, low construction costs, and low maintenance costs.

67-0934

Johnson, G. E., et al. Carbon black produced from coal. Rubber World, 156(3):63-68, June 1967.

Until 1945 almost all carbon black was produced from natural gas by the channel, furnace, and thermal processes. The U.S. Bureau of Mines investigated the production of carbon black from coal, for the rubber industry. Coal is ground to 325 mesh and dropped in free-fall through a heated reaction zone in the presence of a carrier gas. Partial decomposition of the coal occurs at the elevated reactor temperature. The char and heavier solids are collected at the bottom of the vertical reactor, while the carbon black is carried from the system by the gas stream consisting of product gas and carrier gas. Part of the gas enters the reactor with the coal and the remainder enters the top of the reactor. The carbon black is carried by the product gas stream to a wool-felt bag filter where it is collected. The carbon blacks produced from coal in nonoxidizing atmospheres were classified as most closely resembling the fine thermal grade of black made by commercial manufacturers. A gross return on total investment has been shown to be 18.2 percent. Specifications, data on effects of temperature variations, type of carrier gas, and other pertinent facts are contained within this report.

67-0935

Junkyards are necessary. Public Works, 98(1):122, 124, Jan. 1967.

A survey to determine the extent of junkyards in Iowa, conducted by the Co-operative Extension Service of Iowa State University, showed that there were 1,022 junkyards on a total area of 4,191 acres in Iowa. Since junkyards are expected to increase in the future, it is recommended that the most effective way to regulate or control the location and appearance of junkyards is through zoning. Appropriate sites removed from public view should be selected, and if there are no such sites in a community, the zoning commission can require effective screening to hide the yards from view.

67-0936

Keep scrap moving. Metals, 2(14):58, July 1967.

Contrary to the established practice in the scrap business, a small scrap yard in Liverpool has based its success on reducing overhead costs by no-stockpiling, a 24-hr turnover, and a minimum of transport. The family business handles 3,000 tons per month which a mechanization program will increase to 6,000 tons per month. The company does not commit itself to clearing or supply contracts, and the majority of scrap is delivered on a day-by-day basis. Speed and efficiency are the heart of the system. The processing is automatic as far as possible. Four balers and four shears are fed by three Jones mobile cranes fitted with magnets. Two 7-ton cranes are fitted with 5-kw deep-penetration magnets and a 4-ton crane has a 3.4 kw magnet. The Jones cranes are used at every stage of the operation, including loading the processed metal into waiting rail wagons. Much of the scrap can be sent virtually untouched to the steel mills or directly from the factories in a form suitable for the mills. Because the lorries seldom have to wait to unload, the quick turn-round is an attraction to small merchants who must keep the vehicles occupied to make them pay. It also encourages local factories to send their scrap directly to the yard using their own transport. By no-stockpiling and efficient operation, a small plant has set an example for the scrap industry.

67-0937

Kenahan, C. B., and P. M. Sullivan. Let's not overlook salvage. APWA Reporter, 34(3):5-8, Mar. 1967.

Samples were taken from 5 incinerators in metropolitan Washington, D. C., weighed, dried, separated into various fractions, and analyzed. Data represent results obtained from 5,707 lb of wet residues, having a total dry weight of 3,800 lb. Amounts of tin cans averaged 17.2 percent; ash content averaged 15.4 percent; massive iron varied from 1 to 6 percent; unburned organic values averaged 0.7 percent; glass content averaged 44.1 percent; iron wire, stones,, bricks and ceramics accounted for 0.3 to 1.9 percent; and unburned paper and charcoal varied from 6.3 to 12.3 percent. Salvage of the various metals was performed and analysis of the resulting ingots revealed: aluminum, 50 to 70 percent; zinc, 13 to 30 percent; lead, 5 to 10 percent; copper, 5 to 10 percent; iron, 1 to 2 percent; and small amounts of nickel, silicon, and tin. Thus, salvage of all metallic values in the residues, which average nearly 30 percent by weight, could provide a source of revenue for municipalities and aid the conservation of disposal areas, besides reducing haulage costs by half.

67-0938

Lehmann, H., and H. Lohrmann. Contribution to the knowledge of the crystallization of high-acidic Thomas pig iron slags. Tonindustrie-Zeitung und Keramische Rundschau, 90(2):53-65, Feb. 1967.

The high-acidic slags of Salzgitter, West Germany, are used as road paving material. Although produced by a uniform casting process, the slags vary widely in their composition and physical properties, such as hardness. Therefore, investigations were undertaken to reveal the detailed crystallization processes of the slags. Four kinds of slags with calcium oxide to silicon dioxide ratios from 0.64 to 0.77 were examined. With a content of a vitreous phase of less than 1 percent volume, they consist of the two phases melilite and pyroxene. The melilite consists chiefly of akermanite (62-68% mol) and gehlenite. The pyroxene consists of basaltic augite and titanium augite. Also found were magneto-pyrite, magnetite, haematite and iron granules. Crystallization during the cooling process and the behaviour of the multiphase systems are discussed in great detail, supplemented by 32 tables, graphs, phase diagrams, and photomicrographs. The foremost component governing the hardness of the slags is pyroxene. Fast cooling of the slag promotes the formation of pyroxene. With slow cooling, the formation of the softer melilite and of vitreous phases (glass) is favored. To improve the hardness of the slag, it should be kept at temperatures between 1,060 and 1,120 C for a prolonged period of time. The glass forming at the surface should be removed by adding additional layers of slag in regular intervals. Granulating the slag is facilitated by quenching the slag above 400 C. (Text-German)

67-0939

Lei, K. P., and T. A. Sullivan. Molten-salt electrorefining vanadium scrap. U.S. Bureau of Mines Report of Investigations 7036. Washington, U.S. Department of the Interior, Oct. 1967.

A novel molten-salt electrorefining process is developed which provides a practical way to reclaim vanadium from scrap generated in the processing of ductile vanadium into bar, sheet, wire, and other shapes. The process utilizes a potassium chloride-lithium chloride-vanadium chloride electrolyte at 615 C. Starting with scrap having a vanadium content of 99.4 percent, an extremely ductile vanadium is produced with a purity range of 99.93 to 99.95 percent. The electrolytic cell designed for use in the vanadium in the cell feed ranged from 88 to 93 percent with current efficiency of 83 to 95 percent. This process is particularly effective in reducing the interstitial elements, carbon, nitrogen, and oxygen, and some of the metallic impurities in the scrap. The type of scrap utilized is found to affect the iron and oxygen content of the refined vanadium: vanadium refined from heavy and light scrap contained a total of about 340 ppm of iron and oxygen, while vanadium refined from the granular scrap had about 180 ppm.

67-0940

Lejsek, L. Experiences in the utilization of waste calcium sulfate in Czechoslovakia. Tonindustrie Zeitung und Keramische Rundschau, 91(1):12-15, 1967.

The use of waste calcium sulfate accumulating from the production of phosphoric acid was studied experimentally. Calcium sulfate can be used as a regulator in the setting of cement only if a high degree of firmness, especially after the first day, is not required. Since the moisture content of the calcium sulfate is rather high, it is advisable to mix it with cement, filter dust from cement kilns, etc., and to granulate it prior to pouring it into the cement mill. In this granulated state, the calcium sulphate can also be used as a regulator in the production of porous concrete. It has an advantage over natural gypsum since only 2 percent of calcium sulfate must be added while 3 percent of natural gypsum is required to achieve the same firmness. By using calcium sulfate in the burning of portland cement bricks, the burning temperature was lowered by 50 C, while retaining the same quality. When the temperature was not lowered, but left at 1,300 C, bricks with a higher calcium sulfite content were produced. The results of other experiments, discussed in detail, were generally positive. (Text-German)

67-0941

Let's look into waste recycling. American City, 82(7):6, July 1967.

The importance of recycling or reusing waste products is stressed. Since modern technology and packaging methods are creating additional waste products, it is suggested that where reuse is not possible, a tax should be levied on each litter-producing item to cover the cost of disposing of it in a way that will not damage the environment. Such a 'disposal tax' would be comparable to taxes on gasoline which finance highways, leading to further gasoline purchases.

67-0942

Lewis, G. E. Reclamation of steel mill rolls. Welding and Metal Fabrication, 35(10):392-396, Oct. 1967.

Factors causing the lack of acceptance of rebuilt steel mill rolls by mill operators and engineers in Great Britain are discussed and compared with widely used roll reclamation in Russia, the United States, and many European countries. To stimulate interest, the experience in roll rebuilding acquired at Richard Thomas & Baldwins' Spencer works is described. Work began with the reclamation of vertical 24-in.-diameter edging rolls with a fairly high carbon alloy. Attempts were made to reclaim these with hardfacing electrodes, but lack of control of preheat caused difficulties so that a new approach was needed. Submerged-arc welding was investigated and put into operation. The procedure used is described, and a table of temperature recordings throughout the process is included. A number of rolls were rebuilt and put back into service. Mill engineers reported that a life similar to that of a new roll was obtained, but that there was no significantly longer period before rebuilding again became necessary. With the comparable mill life between new rolls and rebuilds, the process represents a very considerable economy for the company. Other rebuilding operations are described, and the use of a preheat furnace now being manufactured is mentioned as a device which will probably overcome some of the current difficulties by allowing greater throughput and more precise control of temperature, in addition to reducing heating costs. In the rebuilding process the selection of welding wires and fluxes, control of the preheat temperature, welding parameters, post-weld cooling, and heat treatment are important. These factors must be balanced to suit the alloy of the parent roll and the weld deposit.

67-0943

Light metal baler. Waste Trade World, 111(23):15, Dec. 2, 1967.

The SP20M hydraulic baler, basically designed to handle ferrous and nonferrous light metal offcuts where a reduced bale height is acceptable, is described. The resulting interlocking action of the collapsed and crumpled metal tends to retain its bale shape without the need for strapping. The bale has a chamber volume of 14 cu ft, measures about 20 by 40 in., and weighs from 220 to 440 lb depending on the nature of the material being processed. The press platen is hinged to the rams of the twin double-acting hydraulic press cylinders. The top section is permanently fixed, and the movement is hinged and controlled by a spring-loaded lever which returns to the 'neutral' position when released. The compressed bale can be secured by passing wire or strapping through special grooves in the press platen. The tapered chamber facilitates the mechanical bale ejection through the chamber door by means of an ejector chain operated by the return platen.

67-0944

Low, A. J. Plutonium recovery from scrap. Chemical Engineering, 74(11):132-134, May 22, 1967.

A process of plutonium recovery based on acid leaching of scrap and solvent extraction is described. The reclamation facility of Isochem Inc. at Richland, Washington, extracts and converts the plutonium content of the metal scraps and sundry wastes from nuclear plants into a high-purity plutonium nitrate. The wastes consist of old gloves, used filters, cardboard, rags, paper, reject plutonium metal, and alloys--along with solutions of chlorides, nitrates, sulfates, phosphates, oxides, fluorides, and oxalates. The scrap is dissolved in hydrofluoric acid following incineration of the combustible types of waste. Aluminum nitrate nona-hydrate is added as a complexing agent for free fluoride. The processing equipment is geometrically designed to prevent nuclear criticality. The aqueous solution is stripped of its plutonium with 80 percent carbon tetrachloride and 20 percent tributyl phosphate. The organic plutonium solution is stripped of its plutonium with dilute nitric acid and concentrated in a falling-film titanium evaporator to 200 to 300 g of plutonium per liter. The plutonium nitrate is then in a form that it can be reduced to the metal, thus completing the recovery of the metal from the incongruous plutonium 'feedstock'.

67-0945

Machinery for reclaiming and handling thermoplastics. British Plastics, 40(8):89-90, Aug. 1967.

The machinery for separating and reclaiming thermoplastics was one of the features of the recent Scrap and Waste Exhibition at Olympia, London. A number of the exhibited machines are described and illustrated. The illustrations include two USI M20 granulating machines of the type used for reclaiming the PVC covering from scrap cables. Two views are shown of the Rigby four-head cable stripping machine in operation, handling a length of PVC cable. For large tough pieces of scrap plastic which have to be reduced in size to permit feed to a granulator, the Automatic Baling Co. has developed a Model CDR-6036-S prebreaker and disintegrator which is illustrated. A unit designed for converting film scrap in bag, sack, or roll form into directly extrudable pellets called the Progress Zerglomat developed by Fellner and Ziegler is illustrated. Also illustrated is the Lodematic tippler for box pallets and containers, which is available for tipping heights up to 20 ft and a reach of 2 ft. The smallest size which is shown can be used for drums. Reclaimed materials which have been processed in a correct manner are not necessarily inferior to virgin material. The reclaimer obtains his thermoplastics from manufacturer's sub-standard material, from sprues and offcuts from processers, from used packaging film, and from used disposable bottles. The major problems in recovery are the separation of the plastic from contamination and the difficulties of identifying the source of the scrap.

67-0946

Magnet handling innovation. Waste Trade World, 111(3):15, 17, July 15, 1967.

A hydraulic excavator now adapted for use with an electro-magnet is discussed. Basically, the only change made in the excavator was to resite the air compressor to the opposite side of the machine and to re-route the air connecting pipes. The magnet's 5 kw 22 volt DC generator is belt-driven directly from the crankshaft pulley of the excavator's 54-hp engine. Adjustments were made which enable the magnet to be operated without the driver having to take his hands off the normal controls. The electric feed to the magnet, a heavy three-core cable, is securely attached to the boom of the machine eliminating the need for a cable-reeling drum. Forty-in. standard and 40-in. deep-lift copper wound magnets are suitable for use with hydraulic equipment. The combination machine handles processed or baled scrap. The electro-magnet can easily be replaced by a six-tine grab or other equipment.

67-0947

Malaysia will attempt charcoal conversion test. Refuse Removal Journal, 10(5):63, May 1967.

Pan American Resources, Inc., hopes to convert trash into charcoal and fertilizer in Kuala Lumpur, Malaysia. The estimated cost for the survey is $46,261.

67-0948

McCarthy, W. W., and H. Walker. Sonolation cuts scrap reprocessing time. Ceramic Industry, 88(3):46-48, Mar. 1967.

The reconstitution of dry clay body scrap, a waste material in the production of insulators, using ultrasonic equipment is discussed. Through the installation of dispersing equipment generating ultrasonic energy mechanically, Ohio Brass Co. has achieved the reconstitution of dry clay body scrap quickly, in large volumes, at low cost, and has produced quality slip. The company has installed a second ultrasonic processing unit to prepare glazes, and is achieving similar advantages. Sonolation of dry scrap has: reduced mixing time of a 1,500-gal batch from 48 hr to a 2-hr premixing period, followed by a single pass through the sonolator at a rate of 50 gal per minute; reduced power requirements; improved product quality; reduced capital expenditures; saved space; centralized the scrap processing system; and reduced drying losses. The operation of the system is described and the ultrasonic unit is illustrated. In the preparation of glazes, the 30-gal-per-minute dispenser can prepare a 200-gal batch in one hour and produce glazes with higher viscosity and a more uniform, stable consistency.

67-0949

Mechanizing scrap metal handling. Waste Trade World, 110(10):14, Mar. 11, 1967.

A new scrap metal conveyor, installed on the premises of James Davidson Whites, Tees-side scrap metal merchants, has considerably speeded up the handling of machine turnings. When a decision to install a new shredding plant was reached, it was decided to improve the handling of the turnings, and the conveyor system was designed and erected by the firm's own staff in conjection with Crone and Taylor (Engineering) Ltd. The turnings are loaded into the shredder by means of a magnet crane or shovel, and after being broken down are discharged on to a 30-ft length of conveyor belt, and carried along to a static beaver stacker angled at 40 degrees. This is about 24 ft overall in length, and is used to load the lorries. Prior to installation of the new plant, a mechanical shovel was used for the loading of broken turnings into the lorries. Loading time has been cut by 15 to 20 minutes, and the company is now considering fixing a stacking bin on to the end of the beaver stackers which offers a positive discharge and will fill a lorry in a single operation. As the bin has a capacity of 36 cu yd, it will enable work to proceed even when a regular flow of vehicles is not available.

67-0950

Merwin, R. F. Expanding use of magnetics. Waste Trade World, 111(9):10, Aug. 26, 1967.

While the steel and foundry industries wish to use more steel scrap because of the low cost, they hesitate because of the erratic quality of most open market scrap, according to a paper presented to the Institute of Scrap Iron and Steel of America. Size reduction of scrap by shears, pulverizers, shredders, or fragmentizers is necessary to prepare scrap for upgrading, but the screening, separation, and inspection of the end product is even more important. While some scrap processers believe that shredders and fragmentizers upgrade the scrap, this is not true except for the removal of airborne dust and light particles sucked out by the dust collection equipment. The type of screening, magnetic separation, or classification equipment to upgrade the scrap should be given as high a priority as the material handling and size reduction equipment. The General Motors technical center is adding magnetic beneficiation equipment and densifiers to an experimental rotary drum for tumbling small squares of scrap since the tumbled material still contained too much non-ferrous contamination. Most processors today use a magnetic drum that tumbles the scrap and shakes out the nonmagnetics. A table is given which shows the scrap charges as percent of total metallics with the actual amount used and the amount which could have been used technically. For steel making, 46 percent scrap was used with the technically feasible amount equal to 79 percent, and for pig iron, 5.8 percent was used, against 100 percent potential. The potential demand for scrap exists, but only for a constant scrap of acceptable quality.

67-0951

Merwin, R. F. Expanding use of magnetics. Waste Trade World, 111(12):14-15, Sept. 9, 1967.

In this second part of a paper presented to the Institute of Scrap Iron and Steel of America, the author indicates that because the automotive foundrymen report a 15 percent loss from scrap purchased on the open market and only a 5 percent melting loss from scrap from well-designed fragmentizing and beneficiation plants, the ferrous foundries will increase their use of quality scrap free of rust, dirt, oxides, and other contaminants. The foreign material not only decreases the furnace output, but increases the slag which attacks the furnace linings. The purchasers of scrap have more rigid inspection than previously with tramp elements such as copper, chromium, nickel, tin, etc., being closely watched with copper being used as a yardstick. Copper should be under 0.05 for rebar steel, only 0.03 for normal quality steel, 0.01 for the highest quality, and 0.05 maximum for deep-drawing sheets. About 25 percent of the process cost should be allotted by the scrap processor for beneficiation and separation which include proper screening, feeding, magnetic separation, and final inspection. Magnetic separation is the heart of the steel scrap processing plant and some shearing, fragmentizing, and beneficiation plants are using multiple magnetic separators. Rugged, permanent, magnetic shakeout or tumbling action separators which require no wiring are efficient and trouble-free. In addition to screening and magnetic separation, materials can be separated by gravity and vibratory air float tables. Scrap dealers must recognize the need to beneficiate their scrap.

67-0952

Metal balers. Waste Trade World, 111(1):11, 13, 16-17, 20, July 1, 1967.

The equipment for baling ferrous and non-ferrous metals is described. There are pictures of commercial equipment including a non-ferrous baler, a doubleram hydraulic metal baler, a shearing lid-type press, and a 12-in. heavy duty baler with a loading hopper. Machines exerting pressures in the region of 800 tons and up are needed to deal with the large volume in many scrapyards and steelworks and to produce the high density bales that bring the best price. Baling presses that operate on an automatic cycle which includes ejection of the finished bale, and which are provided with a hopper that can be preloaded while baling is in progress, enable one man to produce up to 100 units per hr. One of the versions of the American Big Squeeze double-compression presses, the 343 hp with a ram pressure of 800 tons gives 1,587 lb per sq in on the bale to give high density bales weighing 2,600 lb with an output of 15 to 30 tons per hr. Another machine designed to process motor cars completely (except for the engine), gives a bale 24 in. by 28 in. by 34 in. (variable) weighing 1,200 lb at rates up to 18 an hr. Briquetting presses are available for use with a chip-handling system to produce 60 to 90 briquettes per hr from 3 to 7 in. in diameter. The products of 15 British, Dutch, and German firms specializing in presses and balers are listed and described. A large variation in the type of equipment is required by the varying requirements of dissimilar types of users.

67-0953

A method for recovering molybdenum from copper smelting waste slag has been developed. Chemical and Engineering News, 45(18):65, Apr. 1967.

A method for recovering molybdenum from copper smelting waste slag is reported (U.S. patent 3,314,783). The three-step process begins by smelting molybdenum and some iron from thin slag compounds to the metallic state. Quenched in water, the molten mass becomes a granulated product for leaching. The iron is removed with acid leach and the molybdenum extracted in a caustic solution, from which a high-purity molybdenum compound is recovered.

67-0954

Metzger, C. A., et al. Application of radioisotopes for aerospace waste reclamation and water systems. Washington, U.S. Department of Commerce, 1967. 16 p.

The research program and resulting design, development, and evaluation of a vacuum distillation-vapor pyrolysis water reclamation system subjected to a 30-day isotope powered unmanned test are summarized. The application of a radioisotope heat source is expected to result in a simple and more reliable water recovery system producing an excellent quality water without the use of pre- or post-treatment for extended periods of operation. Other water recovery processes that show good promise for the utilization of isotopes for the thermal energy are discussed. The use of several waste management techniques to obtain a complex integrated system are discussed including urine and fecal collection; fecal storage; potable hot and cold water storage and dispensing; and potability measurements that show promise for the use of the waste heat from the isotopes. Some conclusions are: (1) Vacuum distillation-vapor pyrolysis and vacuum distillation-vapor filtered water recovery processes produce potable and sterile water from urine. (2) Liquid level controls proved to be the most difficult problem in the system. (3) Urine solids are extremely abrasive and require special handling. (4) Static phase separators in the urine evaporator are preferable to dynamic devices. (5) Good quality water had been obtained utilizing only carbon.

67-0955

Mobile cranes. Waste Trade World, 110(2):13-15, Jan. 14, 1967.

Two basic categories of mobile cranes, those with strut jibs and those with cantilever jibs, are surveyed. The strut jib is pivoted below the driver's cab, and the weight of both jib and load is largely carried by tie ropes extending to behind the cab. The cantilever jib is pivoted either beside or behind the driver's cab, which avoids any danger of partly obscuring the driver's view. In the smaller cranes, the jib can have a box construction instead of the more conventional lattice work. The weight is carried by hydraulic pistons situated beneath the jib. Advantages of the cantilever principle include the ability to stand closer to a load and to reach over the obstruction more easily, having more room for the load, and comparative invulnerability to swinging loads. The strut jib is virtually useless when the angle of the jib is under 20 degrees from the horizontal. For very short struts, under 9 ft, the cantilever principle is impractical. Up to 25 ft it can carry considerably heavier loads; above this there is a zone when either type of jib is practical, and above 40 ft the strut jib is best. The cranes are offered by several Continental manufacturers because of their extremely moderate prices, but they are incapable of withstanding tough scrapyard handling and may not last even 3 years. Several types of cantilever cranes and strut jib cranes are described.

67-0956

Mobile cranes--Sennebogen S.883. Waste Trade World, 110(9):16, Mar. 4, 1967.

Moodyplant Ltd. claims that the criticism of Continental strut jib mobile cranes appearing in the Jan. 14, 1967 issue of this journal does not apply to the cranes they offer. Their Sennebogen S.883 has proved popular where economic and rapid material handling is required. The crane is mounted on 22-ton axles fitted with eight track grip tires. Power is supplied by a 30-hp air-cooled Deutz diesel engine with 12-volt electric cold weather starting system and cab heating installation. An oscillating front axle insures maximum traction which, on soft ground, is equal to that of a tracked machine. Straight lattice jibs from 23 to 49 ft can be fitted, giving a maximum lifting capacity of 9,460 lb free on wheels and 12,100 lb with outriggers fitted. Other features include: double drums for grabbing operations; power-operated tagline equipment; a derricking winch which provides simultaneous operation of derricking, slewing, and hoisting motions; and a heavy duty drawbar and robot towing attachment. Optional equipment is mentioned.

67-0957

Mohrer, H. Z. Utilization of secondary materials in paperboard mills. Tappi, 50(9):109A-114A, Sept. 1967.

With the production of sophisticated paper products continuing to accelerate, mills with the capability of utilizing a broad segment of the modern paper stock market will have an economic advantage over those which practice more restricted utilization policies. The problems of limiting the consumption of virgin pulp by the substitution of secondary material include that of returning the secondary material as near as possible to its original, unconverted purity. The complexity of the situation is apparent from the 45 or more common grades of paper stock now on the market and the 37 contaminants which are sufficiently harmful to spoil any usefulness of any packing in which they appear. The four key variables for determining the stock system of a specific grade are brightness, tear strength, undispersed dirt, and shrinkage. Among the numerous tables and charts are three which show the supply per month of stock received. Large deficits in receipts are shown in January, February, August, and September. An example is shown of a quality report on raw materials. Four tables are shown of the brightness, tear factor, undispersed dirt, and shrinkage of 24 pulp and paper stocks according to quality classifications. Four pictures are given of various papers showing the composition of typical dirt content. Included are four tables which show paper stock classifications according to the four variables mentioned above, the costs per ton, and the increase in value per ton from recovery operations.

67-0958

Muir, J. Processing of mixed waste paper. Paper Technology, 8(3):265-269, June 1967.

The development of a 7-ton-per-hr plant that produces a particularly clean pulp from mixed waste paper is outlined. The system includes the first commercial installation of a low specific gravity contrary-purging system which allows continuous operation of a high intensity rotor pulper. Waste paper contains contraries which can damage subsequent fibre-treating machines and must be removed during the pulping process. The best estimate of the weight of contraries is between 3 and 7 percent. The low specific gravity contrary-purging system (illustrated) consists of an extraction chamber mounted on the side of the pulper. The stock passes through a 1-in.-deep horizontal slot which is kept from being blocked by a rotating scraper arm. In the high intensity rotor pulper (illustrated), the rotor is mounted above a perforated bed plate which screens outgoing stock. The rotor pulper does some despecking and defibering while performing its normal pulping function. In conventional pulpers it may be necessary to drop the entire contents of the pulper once in 48 hr to clean out the contraries. The cleaning and screening of the stock extracted through the 1/8-in.-diameter holes in the rotor pulper can be carried out in equipment normally found at the wet end of a paper machine. A flow sheet is given for an asphalt dispersion plant for treating the stock prior to a lightly loaded refining system.

67-0959

Musselmann, W., and J. M. Voith. Stock preparation for sorted waste paper. Paper Technology, 8(3):270-277, June 1967.

The low and high consistency methods of repulping waste paper are compared and typical stock preparation systems and new preparation machines are described with diagrams and charts. A summarizing chart shows that treatment at high consistencies yields increasing volumes and porosity in the paper. Charts also show that the tensile strength and number of folds were slightly lower for stock treated at higher consistency. Stock from the disintegrator was superior in cleanliness and homogeneity to that from the deflaker and gave paper with higher volume and porosity. Five flow sheets are given of processes covering different stocks and final products. A three-stage centrifugal system is required to remove the aluminum in the recovery of an aluminum foil laminated paper. In a double-disc, high-speed deflaker (diagram given) now available, the perforated rotor disc and two perforated stators ensure fiber preserving treatment in the defibering and despecking of low consistency stock. A new belt thickener is illustrated which uses a fabric belt thickener. A sketch of an advanced low-speed single-shaft disintegrator shows 60 projecting pyramids on the rotor in a housing with 46 round pins which function as a stator to give a combing action between the rotor teeth. The increased amount of waste paper being repulped for use as a partial replacement of groundwood and virgin pulp has been made possible by technical progress in repulping methods.

67-0960

Netzley, A. B., D. F. Walters, and J. E. Williamson. Incineration; debonding of brakeshoe and reclamation of electrical equipment windings. In Air pollution engineering manual. Public Health Service Publication No. 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967. p.471-481.

Brake shoe debonding and reclamation of electrical equipment windings are similar combustion processes differing from incineration processes in that the combustible contents are usually less than 10 percent by weight, and high temperatures must be avoided to prevent damaging the salvageable parts. Burning at temperatures less than 1,000 F consumes all combustible organic compounds. Reclamation by open burning or a single-chamber device results in the emission of large quantities of smoke and odors. Two basic configurations of equipment are used for reclamation. One is a single structure housing the primary and secondary combustion chambers; while the other consists of two separate pieces, a primary chamber, and an afterburner or secondary chamber. Sizing and burner capacity computations are discussed for the primary ignition chamber, and the secondary combustion chamber or afterburner. Typical reclamation equipment is a modified multiple-chamber incinerator with an oversized ignition chamber without grates and ashpits. An illustrative problem shows a method of designing batch equipment to debond brake shoes or generator field coils.

67-0961

Netzley, A. B. Incineration. Wire reclamation. In Air pollution engineering manual. Public Health Service Publication No. 999-AP-40. Cincinnati, National Center for Air Pollution Control, 1967.

This process differs from other reclamation in that the combustible content of the charge is always more than 10 percent by weight and usually exceeds 20 percent. Inorganic materials such as fiber glass and ceramics are noncombustible and are removed mechanically. Not all combustible insulation can be removed by burning because of excessive oxidation of copper. The only practical industrial equipment available for controlling emissions from single-chamber insulation burning incinerators is an afterburner or second combustion chamber. Control of primary chamber combustion air is critical for prevention of high temperatures and restriction of burning rate to prevent overloading of the secondary chamber. A table of equipment design factors gives recommended values of gas velocities, combustion air, auxiliary burner and draft requirements for primary and secondary chambers. A problem illustrates the design of equipment to process a 250-lb batch of commercial insulated electrical wire containing 25 percent combustibles.

67-0962

A new type of scrap processing plant. Waste Trade Journal, 63(52):12, Dec. 30, 1967.

A new type of scrap processing plant in Erie, Pennsylvania, demonstrates how junked automobiles may be successfully reclaimed, even in relatively small population centers. By the application of magnetic action engineered into the auto-maceration system, the new plant is able to produce scrap rated as 'ideal' by the big forging plant which is taking its entire production. A typical chemical analysis of the non-ferrous elements is: 0.06 percent carbon, 0.40 percent manganese, 0.024 percent phosphorus, 0.035 percent sulfur, 0.10 percent silicon, 0.12 percent nickel, 0.06 percent chromium, 0.02 percent molybdenum, 0.11 percent copper, 0.001 percent tin, 0.001 percent antimony, and 0.009 percent cobalt. The plant can chew up old cars at the rate of 200 per day. The processing line starts with old cars from which such saleable items as radiators, engine blocks, and wheels, have been removed.

67-0963

New waste paper mill. Waste Trade World, 110(9):4, Mar. 4, 1967.

A new £750,000 waste paper mill, which will handle about 500 tons of waste paper a week, is described. Products will include chipboard, and liner and specialty boards, in addition to materials which will be used for products ranging from tubes for the creation of concrete columns on highways, household foil cores, and air ducting to soap powder containers for launderettes. The mill was built in response to the demand for additional board and paper, and it is anticipated that its output will approach £1,000,000 in value. A main feature of the mill's equipment is a 300-ft-long board-making machine, the drying section of which is fitted with 71 2-ton rollers. Ninety employees work a three-shift system for 5½ days a week, with a 7-day week anticipated in the near future.

67-0964

Nolan, W. J. Processing of bagasse for paper and structural board. Tappi, 50(9):127A-136A, Sept. 1967.

The work that has been carried out at the Pulp and Paper Laboratory of the University of Florida on the utilization of bagasse in the paper industry over the last 15 years is reported. Bagasse, the residual cane stalk after sugar has been extracted, presents a number of variables to the paper process engineer over which he has no control. This paper is concerned with the variables over which the engineer can exercise some control such as storage, pith removal, pulping, and pulp characteristics. Assuming that a thorough depithing of bagasse fiber is essential to high quality pulp products, a procedure is described of decortication in an attrition mill, followed by washing the pith and fines from the fiber on a traveling screen belt. Tables show: the strength of bagasse, pine kraft, and bagasse-pine pulp mixtures; forming characteristics of bagasse wallboard; strength and water absorption of wallboard; and physical characteristics of hard board from depithed Cuban bagasse. Essentially the same data is shown on six charts. The pith fraction which has been considered as a nuisance contains 20 to 22 percent lignin and 27 to 30 percent pentosan and it should be possible to use this waste as a raw material for the manufacture of furfural. There is also a possibility of developing a market for the solid lignin residue resulting from the acid hydrolysis producing the furfural. The future of bagasse for paper and board depends on research to evaluate the importance of depithing, utilization of the pith, and optimum cooking conditions for bagasse fiber.

67-0965

Nupress pneumatic baling machines. Public Cleansing, 57(2):108-109, Feb. 1967.

The baling box, developed to handle the ever-increasing amount of waste paper, is a feature of the Nupress Baling Machines. It is moved pneumatically completely clear of the ram, enabling the box to be fed by conveyor. Other advantages are: (1) The power is supplied by compressed air. (2) There are no systems to be overloaded. (3) Safety features are used. (4) The bale density can be controlled. (5) All machines can be operated from one compressor. Operation by levers is extremely simple and the machines are suitable for bulky material. The output is dependent on three factors: the type of material being baled, the speed at which the box can be filled, and the time taken for wiring.

67-0966

Official view on waste paper and abandoned vehicles. Waste Trade World, 110(21):3-4, May 27, 1967.

A report of the Ministry of Housing and Local Government on their refuse storage and collection work is reviewed. Waste paper was declared the only salvageable form of domestic waste. The work party suggested local councils supply householders with sacks which should be emptied into enclosed vehicles on periodic routes. Also discussed was the problem of disposing of abandoned vehicles. Problem questions included: under what authority could a car be towed away, that of the owner of the car or the owner of the property on which it was left; and what length of time indicates that a car has been abandoned.

67-0967

Oil disposal with foam. Petroleum, 30(5):97, Sept.-Oct., 1967.

A new method of oil removal from water and reclamation has been developed by Esso together with Bibby's Oleochemicals Division. In a demonstration, 45 gal of crude oil were poured into the water at Ashlett Pond, Southampton. Shredded Bibbipol, a polyurethane foam, was then spread upon the oil. Within minutes the white foam began to turn black as it absorbed the oil from the surface of the water. Then a flexible boom, consisting of a small bore net full of shredded foam, was towed toward the shore, confining the oily foam within its arc. The oil-saturated foam was removed from the water, leaving the surface virtually free of oil. The foam was then passed through rollers to recover the oil. The recovered liquid contained over 80 percent oil and the pressed foam was ready for reuse. A major advantage of the foam is that it has a natural affinity for oil, while absorbing little water. It is also completely non-toxic, and harmless to marine life. It is estimated that 50 cu ft of foam would absorb 1 ton of oil at a cost in materials of £5. The comparable cost of dispersants to remove a similar quantity of oil would be about £130. The foam technique is still in a developmental stage and further study is needed on methods of shredding the foam and on its subsequent recovery.

67-0968

On the right lines to deal with the old rail cars. Public Cleansing, 57(11):604, Nov. 1967.

To devise a better method than open burning for the salvaging of scrap and reusable metal from the 100,000 freight cars that go out of service each year in the United States, the Solid Wastes Program of the U.S. Public Health Service's National Center for Urban and Industrial Health has awarded a $50,000 contract to Booz, Allen Applied Research, Inc. to carry out a comprehensive study of railroad car dismantling and recommend new approaches that will eliminate pollution problems and still allow for practical and economic disposal of obsolete cars. Under the 6-month contract, the current operating practices of railroad car dismantlers throughout the country will be studied, the information on proposed new techniques summarized, and feasibility studies of new techniques that promise acceptable pollution control will be conducted. Leo Weaver, Head of the Solid Wastes Program, has indicated that there is keen interest in this project because of its possible application in the disposal of bulky wastes (e.g. junk automobiles), and its significance as an example of government-industry cooperation.

67-0969

O'Bryan, W. J. Corrugated waste pelleting. Tappi, 50(4):43-44, Apr. 1967.

A system for compacting corrugated waste by pelleting is described which gives higher densities and uses smaller plant areas than is possible with high-density baling operations. A Daffin Pelleter made up of steel rings and contoured divider teeth will take metered, shredded, corrugated waste and, by forcing it through openings in the divider teeth, will give a high-density (90 lb per cu ft) pellet 1 by 1 by 2 to 3 in. When the pellets are bulk loaded into a car the density is 40 lb per cu ft compared to 25 lb per cu ft from baling. Shipping tonnage in 40-ft cars is in excess of 50 tons. The pellets can be conveyed mechanically or pneumatically to storage or to the transport vehicle. Pelleting will be the manner of scrap collection of the future, based on low labor costs in manufacture, reduced freight charges per ton because of higher car weight, reduced mill handling costs, silo storage, and space saving.

67-0970

Obrzut, J. J. Will steel buy scrap's new look? Iron Age, 199(2):57-65, Jan. 12, 1967.

Although scrap processing is a vital adjunct of steel making, the changing iron and steel industry is becoming more selective, and bundles, bales, and slabs of scrap are no longer in great demand by the steel companies. The basic oxygen furnace output which uses less than 30 percent scrap has increased in the last 10 years from zero to 18 percent of all steel production while open hearth production which uses 42 percent scrap has decreased to 72 percent from 89 percent. The scrap processor must meet the decreased market with a better quality product at lower cost which involves shredders for automobiles which may cost up to $3 million, but can reduce an automobile body to clean, dense, free-flowing, fist-sized chunks of scrap with copper content between 0.15 and 0.20 percent. The progress in equipment and methods is brought out in the numerous illustrations, sketches, and a table. Shown are the new Logeman shear which can slice the full width of a car. Two pictures are shown, one of a conveyor delivering old cars to a Luria shredder, and the other of the shredded scrap that feeds Bethlehem's electric furnaces. A table is given which shows the origin of scrap, the equipment needed for its processing, the grades of scrap, and their uses. A sketch shows the operation of a magnetic separator upgrading scrap, and two sketches show proposals for melting auto bodies directly into hot metal. Other pictures show briquetting machines, a magnet on a crane, a shredder, and a chute for efficient scrap handling.

67-0971

Organic wastes--source of electrical energy. Compost Science, 7(3):5-6, Winter 1967.

Dr. Frederick D. Sisler of the U.S. Geological Survey said scientists have found a way to turn corn cobs, sawdust, and other organic waste materials, especially those high in sugar, into electricity-generating fuel. He added, 'Perhaps we should be building power generating units instead of sewage disposal plants.'

67-0972

Overband magnet separators. Waste Trade World, 111(7):10, Aug. 12, 1967.

Equipment is described which will protect large crushers and similar heavy installations used by companies having deep-burden conveyors. The Unimag oil-cooled heavy-duty electromagnetic overband separators have been designed to remove ferrous material up to 300 lb through a heavy burden on a conveyor. One of the installations, 48 in. wide, weighing 15 tons, and containing 3½ tons of copper in the energizing coil, is shown in an illustration. The oil-cooled separator can operate above conveyors as wide as 72 in. with clearances of 24 in. between the surface of the conveyor belt and the underside of the magnetic overband belt. The magnet is made from high permeability steel, with the coil wound with high conductivity insulated copper wire assembled in sections directly on the core of the magnet. Corrugated stainless side panels form the totally enclosed assembly which is filled with transformer oil coolant which also prevents the infiltration of dust and moisture. The transformer oil is circulated by a sealed pump complete with a radiator through the sectionalized coil assembly to dissipate the heat generated and permit the magnet to operate at peak efficiency for longer cycles without excessive temperature rise. The conveyor belt which passes under the magnet is made of heavy-duty butyl rubber with special magnetic feelers to protect the belt from damage and to help remove smaller pieces of iron.

67-0973

Pajalich, W. Iron and steel scrap survey in Illinois, Indiana, Iowa, Michigan, Minnesota, and Wisconsin. U.S. Bureau of Mines Information Circular No. 8342. [Washington], U.S. Department of the Interior, 1967. 49 p.

The results of a study made by the Bureau of Mines on the generation, utilization, and consumption patterns of ferrous scrap in six North Central States, the organizational framework of the ferrous scrap industry, of the products produced, and of the factors affecting the consumption of ferrous scrap by the steel industry are presented. The six States covered are Illinois, Indiana, Iowa, Michigan, Minnesota, and Wisconsin. The six States represent an important segment of the nation's scrap industry, accounting for about one-third of the ferrous scrap consumed in the United States. In 1963 these States had about 1,500 ferrous scrap dealers employing more than 9,000 persons with sales exceeding $300 million. This, and previous studies of the industry were undertaken by the Bureau to study changing patterns of ferrous scrap use during the past 10 years. The underlying causes for these changes and the degree to which the causes affect the scrap industry are discussed. Contrary to some concepts, scrap is not melted to make special or inferior iron and steel products; rather, it is a universal raw material for the iron and steel industry. 'New' iron or steel products can be made from 100 percent scrap. Numerous supporting data and illustrations are furnished.

67-0974

Pajalich, W. Conclusions. In Iron and steel scrap survey in Illinois, Indiana, Iowa, Michigan, Minnesota, and Wisconsin. U.S. Bureau of Mines Information Circular No. 8342. [Washington], U.S. Department of the Interior, 1967. p.42-43.

The uniqueness of ferrous scrap waste is that it has utility equal to the natural raw material, iron ore. Scrap is higher in iron content than are natural ores. The utilization patterns of firms using blast furnaces, pig, and hot metal, suggest that fluctuations in steel ingots and castings production affect the consumption of hot metal and pig more than purchased scrap. Electric furnace ingot production ratio to scrap consumption increased from 85 percent in 1957 to 94 percent in 1962. However, the total ingot production trend was downward and as a result, the scrap consumption declined accordingly. Although the oxygen furnace was increasingly used between 1957 and 1962, the amount of scrap consumed by this method of steelmaking was not large enough to be reflected in the total consumption of scrap by all the firms studied in the six North Central States. The steel industry's independence of purchased scrap is increasing more rapidly with the development of oxygen steelmaking processes. This development can cut scrap requirements materially, and possibly most scrap requirements in many instances can be fulfilled by home scrap generation.

67-0975

Paper baling at Bury. Public Cleansing, 57(2):78-79, Feb. 1967.

Wastepaper handling arrangements were altered to provide a mechanical feed direct to the paper press during the recent reconstruction at the Separation and Incineration Plant at Bury. Now the 36-in.-wide wire mesh leads to the new Handley Lake 'Ambassador' press, which has a 54-in. manual control hydraulic press with a 6-in. extended hopper. The finished bales are 5 by 2 by 3 ft, weigh 6 cwt and have an output of 5 tons per day (50 percent of this having been collected by two employees from the picking belt).

67-0976

Phillips, R.F. Solid waste--a natural resource. In Proceedings; Solid Waste in Urban Environments--a Community Action Seminar, Houston, Mar. 9, 1967. University of Houston. p.27-37.

After a brief background review of refuse production, disposal problems, the status of waste reclamation, and the problems involved in closing the loop to recycle wastes as raw materials in their original use, a concept for the utilization of wastes in construction, horticulture, and agriculture is considered. The bulk of the small volume of refuse that is salvaged is returned as raw material to the original use for such materials as paper, glass, metals, rags, and rubber. Present markets do not encourage recycling, process technology is not suited to recycling, transportation costs are high, and separation costs are high. In one system, the concept is to use the waste after separation into general types for the manufacture of products in demand in the urban area or in agricultural areas tributary to the urban centers. In another system, it is proposed that waste be converted into construction materials and soil conditioners. Lightweight aggregate prices are on the order of $20 to $50 per ton in urban markets. If satisfactory refuse-based products can be developed, this market could be attractive during the commercialization of the process. The high-priced small volume peat moss market should be immediately attractive for compost. A marketing system will have to be developed to handle the large volumes and seasonal storage and application problems of agricultural compost. Market information on compost potential and prices should be gathered along with refuse collection and conversion and compost marketing economics for the evaluation of the feasibility of compost production. Typical systems are diagrammed.

67-0977

Pierau, E. Planning a scrap processing plant to ensure utmost efficiency. Foerdern Heben, 17(16):933-936, Nov. 1967.

To illustrate the operation of a scrap processing plant so that the most efficient processing of the material can be achieved, an example is given of a German company in Kiel-Gaarden. The plant is located in the harbor, directly at the waterfront. The company collects the scrap in containers having a capacity of 5 cu m and 7 cu m, which can be loaded onto the trucks without using a crane, thus effecting cost savings. The containers can be tilted for unloading. The scrap is sorted and manually processed with a combination shear/baling press. The processed scrap is shipped away either by railroad or by freighter. Two cranes are necessary to do the loading. The company first used mobile cranes which did not prove to be very suitable; they were soon supplanted by a gantry crane. To improve the efficiency of the processing plant itself, it was raised 6.50 m above the site. This permits the direct loading of processed scrap into railroad cars. For loading onto the freighters, an additional crane was set up. Personnel costs were considerably reduced by these modifications. Illustrations of the scrap processing plant and the cranes, as well as technical data, are given. (Text-German)

67-0978

Pillai, S. C., E. C. Srinath, M. L. Mathur, et al. Activated sludge as a feed supplement for poultry. Water and Waste Treatment Journal, 11(7):316-320, 322, May-June 1967.

Interest in the utilization of activated sludge as a feed supplement for poultry to replace the protein in animal feeds and as a source of vitamin B12 raises the question of the effect of activated sludge on growing chicks and laying birds. Experiments were carried out over a period of a year to determine if the activated sludge could be used as a feed supplement for poultry. Based on the analysis of a control poultry feed and the analysis of an experimental feed and a layer mash containing 50 percent of the peanut cake replaced by sludge and a feed with 50 percent of the fish meal replaced by sludge, data were obtained and shown in tabular form of the influence on the growth of the birds, the feed consumption, and the egg-laying record. The sludge not only had no harmful effects on growth of the chicks and egg-laying performance, but was actually beneficial. Inasmuch as the sludge contains original sewage matter undergoing changes and microorganisms in various stages of development, the hygienic aspect is a matter of concern. Based on the lack of any effect on these chicks and hens and previously reported animal studies, there appeared to be no hazards to the health of the poultry. The reasons for the beneficial effect on the chicks is not clear, except for the vitamin B12 and the possible effects of the amino acid composition of the sludge and substances such as coenzyme Q.

67-0979

Porteous, A. Towards a profitable means of municipal refuse disposal. ASME Paper No. 67WA/PID-2. Presented at Winter Annual Meeting, American Society of Mechanical Engineers, Pittsburgh, Nov. 12-17, 1967. 17 p.

Refuse disposal processes which can generate revenue from the sale of by-products are studied. Economic evaluation of several alternatives reveals ethanol production from the wastepaper content of the refuse to have strong profit potential. This is studied in depth and a design is proposed with sufficient flexibility to enable the process to function profitably despite chemical kinetic uncertainties. Further work is recommended to take ethanol production from refuse to the pilot-plant stage with the ultimate objective of full-scale municipal installation for refuse processing.

67-0980

Possible use of waste matter as fuel for rockets examined. Refuse Removal Journal, 10(12):18, Dec. 1967.

The National Aeronautics and Space Administration is examining ways of using waste matter produced by the crew of a spacecraft as possible fuel for rockets. Companies studying possible applications include Rocket Research Corporation, Marquardt Corporation, and Avco Corporation. Rocket Research Corporation believes that some of the techniques being developed for space ships could be utilized in sewage plant techniques so that wastes can be utilized for low-cost production of heat, steam, and electricity. One process is the 'dry burn' method, where sewage is dried and then burned to generate heat, which is then used to dry more sewage and produce steam.

67-0981

Power from rubbish. Electrical Times, 151(17):673-674, Apr. 27, 1967.

The London Council's Deephams refuse disposal plant will come into operation in 1970 as the first in Great Britain to use total, continuous incineration for producing power. The £9 million plant will handle 1,333 tons of refuse a day delivered by 700 trucks to produce from 27 to 40 MW. The refuse will be charged to five stepped, roller-type grates from the hoppers by hydraulic rams. The boilers will operate at 625 psi at 850 F. Steam from the five boilers passes to four 12.5 MW single-cylinder turbines designed to operate at 600 psi and 840 F. When finished the plant will be one of the largest refuse disposal works in the world.

67-0982

Precision guillotine. Waste Trade World, 110(15):13, Apr. 15, 1967.

The Besco 8/25 Mark II is an all-steel precision guillotine made by J. S. Edwards Ltd. The machine can shear plate up to ¼ in. thick, and also non-ferrous metals. The upper and lower blades are 100 in. long and four-edged carbon chrome blades are fitted to the cutting beam. The average cutting speed is 35 strokes per minute, and operation is controlled by a movable footswitch. Single or continuous strokes can be selected by means of a push-button. The guillotine is powered by an 8-hp highslip electric motor, and is supplied complete with isolator switch and front gauges measuring up to 36 in.

67-0983

Prior, P. H. Secondary fibers in Britain. Pulp and Paper, 68(12):T655-T658, Dec. 1967.

The fiber recovery industry in Britain, which amounts to 1 1/2 million tons of paper and board annually, is described. Explanation of steps being taken to deal with the growing problem of pernicious contraries (nonfibrous contaminants difficult to see or detect) is emphasized. The movement of recovered material from source to mill takes place in a complex network built up over many years, with personal relationships a prominent feature. However, in recent years an influx of new contraries has become a major problem in the industry. The elimination or segregation of these contaminants needs to be dealt with at an early stage to reduce the amount reaching the mills. A central organization, The British Waste Paper Utilization Council, was set up in 1959 for technical study of the problems involved, for disseminating information to encourage segregation of waste paper containing contraries by the initial users, and for consultation with other organizations. With the use of advertising methods, the Council has been successful in alerting the wide range of people concerned to the importance of early identification and segregation, and has been able to initiate the substitution of harmless materials for some dangerous ones.

67-0984

Promise of 'tailings'. Industrial Research, 9(4):43, Apr. 1967.

Research being conducted at Stanford University proposes making high-pressure, steam-cured calcium silicate building materials from mine tailings. The study, headed by Cedric W. Richards and Torben C. Hansen, grew out of O. C. Shepard's suggestion that tailings might be useful in light-weight concrete aggregates. Such building materials are widely used in Europe. Silicates extracted from U.S. wastes may not work the same way, due to various possible contaminants. Thus the tests being run on samples will determine the feasibility of the Stanford proposal.

67-0985

Provide 'information' early for others to make plans. Waste Trade World, 3(8):10-11, Aug. 19, 1967.

This article is the second part of a paper on efficient scrap yard layout given at a meeting of the Institute of Scrap Iron and Steel of America and pertains to the relocation of an established firm. The emphasis is placed on obtaining information as soon as possible so that the architect can coordinate the structural, mechanical, water, sewer, electrical, and other pertinent data. For the shears and shredders, the architect needs data on foundations, frames, guards, access ladders, and catwalks. One desirable step, in the advance work, is shop inspection of the equipment during construction. It is most important for scrap processors to make a concession to public opinion and to consider the view approaching the yard. It is also important to place equipment, such as the scrap shear, well above grade to protect it from ground water, heavy snowfall, and ice. The electrical switchgear building should be placed as near as possible to the center of its load, which would require placing it close to the scrap shear. If possible, competitive bidding ending with lump sum contracts is to be preferred. If alterations are involved or insufficient information is available in advance, competitive bids should be taken for cost-plus contracts. Whenever a new yard is to be built or a piece of equipment is to be added, it is desirable to utilize any possible means of improving the efficiency of the yard. Consideration should be given to the total development of the scrap yard and the community, with an allowance for expansion.

67-0986

Putting scrap to work. Machinery Lloyd, 39(15):3, Aug. 5, 1967.

The waste recovery industry contributes materially to the national economy in a country like the United Kingdom which imports the bulk of its industrial raw materials to the detriment of its balance of payments. Figures released at a recent Scrap and Waste Exhibition in London showed that the waste recovery industry's output is £1,650 million per year, which replaces United Kingdom's imports, in addition to £90 million per year of exports. Twenty million tons of iron and steel scrap valued at £200 million are used by the United Kingdom's iron and steel makers. Forty percent of the copper, 36 percent of the aluminum, 23 percent of the zinc, and 51 percent of the lead out of a total non-ferrous consumption of 1.6 million tons, which replaced £800 million in imports, were recovered from scrap and residues. There is increasing cooperation between metal-working concerns and the scrap and waste recovery industry. An increasing number of firms are treating swarf to recover the expensive cutting oil and then packing the clean metal scrap in truck-sized containers. This typical case is beneficial to all with the engineering company's saving the wasted cutting oil and getting a better price for their swarf, the scrap merchant's being able to handle the containerized swarf with less labor, and the steel industry's receiving a cleaner and better raw material for remelting.

67-0987

Qureshi, Q. A., and M. E. Dubash. Potential fibrous raw material for the manufacture of paper. Pakistan Journal of Science, 19(1 & 2):67-72, Jan.-Mar. 1967.

Due to the forecasted demand for paper in Pakistan, investigations were undertaken to determine potential fibrous material which could be used for the manufacture of paper. Samples were tested for cellulose, a-cellulose, silica, fiber-length, and pith (dry and wet method). Results are given for 12 native raw materials. Two of the materials, bagasse and junter, seemed the most promising. Junter is a small, shrub-like bush and is sufficiently white, soft and free from heartwood and bark to be used in making mechanical pulp. However, its cultivation for the purpose of making paper would only be economical if its use for fertilizer and for seed production were exploited. Bagasse is available and its potential seems bright. Although bagasse is at present being used as a fuel by the cane plants, availability of suitable gas for this purpose makes almost the entire amount potentially available for paper manufacture. Pilot studies are necessary to develop mechanical pulping of bagasse.

67-0988

Raie, M. Y., N. Shakir, M. K. Bhatty, and Karimullah. Preparation of an adhesive from the vegetable-tanned leather scrap. Science and Industry, 5(4):575-579, Oct. 1967.

Successful attempts have been made for the conversion of scrap into a plastic mass which, as such, or in combination with rosin, has yielded, after treatment with formaldehyde, quite superior binding materials. On application to wood laminates, the adhesive gives as satisfactory a binding performance as that obtained from the application of phenol-formaldehyde, urea-formaldehyde, and epoxy resins. Leather scrap is hydrolyzed with sulfuric acid into a plastic mass which is dried and powdered. The powder, either alone, or in combination with rosin, is heat-applied immediately after treatment with formalin. In the past, little use has been made of the scrap for the production of leather-based adhesives; only a few attempts have been made to convert chrome and vegetable-tanned leather scrap into an adhesive by hydrolyzing the scrap with a mineral acid and then mixing it with a suitable reagent such as magnesium oxide. Experimental procedures are outlined and supporting data are furnished.

67-0989

Raimondo, F. E. Deinking of printed wastepapers by flotation. Tappi, 50(9):69A-74A, Sept. 1967.

The effect of physical factors and the use of filters in the flotation stage on the brightness of de-inked printed wastepaper is reported. Photographs are shown of an industrial flotation cell, a battery of industrial flotation cells in operation, and a laboratory cell. A chart is given of the comparison between runs on an industrial flotation cell versus a laboratory scale flotation cell which gave similar results. The operational parameters and their effects on brightness are shown on a series of charts which show the effects of wastepaper mix, duration of flotation, flotation shock temperature, water hardness, pH, impeller speed, air present in stock, and filler quantities. Brightness increases with the increase in magazine stock. Ink removal is good with newspapers, but not as good as with magazine stock. The brightness increases with the flotation time. Temperatures in the 40 C range appear satisfactory in practice. The pH should be kept in the 9 range. There is a marked increase in the brightness with an increase in rotational speed. There is no increase in brightness with an increase in airflow above the minimum. The use of fillers produced an increase in brightness from the whiteness of the fillers and not from absorption of the ink particles onto the fillers. The addition of fillers to the stock before flotation does not have any advantage. The chemicals used were 2 percent sodium peroxide, 5 percent sodium solicate, 0.38 percent Biancal concentrate and 0.02 percent resoline.

67-0990

Rationalization of scrap processing will reduce steelmaking costs. Metals, 2(14):55-57, July 1967.

The reduction of steel making costs to meet overseas competition may be attained by an increase in the efficiency of scrap handling and processing. The

Richard Thomas and Baldwins plant has set up a scrap handling unit adjacent to its steel plant, which will process, stock, and deliver scrap charges against the steelmaking requirements to rail-mounted charging machines. Photographs show two bay scrap yards adjacent to the steel plant, two Lindemann Lulan cranes fed by 65-in. magnets, with light scrap being baled and delivered to a fixed slide. The unprocessed scrap in the first bay is passed to two shears for processing, while the light scrap is baled and stored in the second bay, where provision is made for various types of scrap. The replacement of crane-charging by a rail-bound charging machine in the steel mill frees the cranes for hot-metal use and provides a more accurate means of charging. On the principle that scrap processing is a specialized job, the steel-maker can concentrate on making steel. The plant will be furnished with a more uniform material which will permit easier charging and faster melting. The improved delivery of scrap to the furnace will free crane capacity. The planned scrap preparation and handling facility at this steel plant could be an important factor in meeting overseas competition by increased efficiency.

67-0991

Reclamation of old newspaper by de-inking. Research and Industry, 12(1):23, Jan.-Mar. 1967.

Old newspapers, presently used as packing material, and eventually disposed of as waste, are de-inked for reuse as newsprint by a new process developed at the Regional Research Laboratory at Jorhat, India. The process involves the pulping of old newspapers at slightly elevated temperatures in the presence of suitable chemicals such as surface-active agents, detergents, and sodium hydroxide to separate the fibers from the ink. After screening to remove coarse impurities and dilution to the proper consistency, the ink particles are removed from fibers in a flotation cell. As desired, the pulp can be used alone or in combination with virgin pulp. The de-inked stock provides an economic use for old newspapers and a substitute for virgin pulp at Rs 1070 to 1110 per ton. The savings depend on the cost of the virgin pulp. The cost of the installed de-inking unit is much less than a chemical or mechanical pulping mill and the time required for pulping is shorter.

67-0992

Reclamation project. Electronics, 40(25):58, Dec. 11, 1967.

A process, developed by Metallurgical International, to reclaim tantalum scrap is reported. Most tantalum capacitor makers sell their scrap and rejects for use in alloys and mill products at about $10 a lb, in contrast to the original cost of the metal which is about $35 a lb. However, with the new process, capacitor-grade powder can be reclaimed for $15 a lb. Once the capacitors have been reduced to tantalum slugs, they are pulverized into a powder by the patented Cold-stream process. The particles are then recirculated and passed through a mesh until they are about the same size. A reactant gas separates all impurities from the powder and a furnace draws off residual gas, leaving the powder as pure as that made directly from tantalum ore. It is claimed that the shape of the particle, which is irregular, is superior to the circular or dendritic shapes produced by conventional methods. Tight packing provides high capacitance and lessens the number of sharp points that invite voltage breakdown in capacitors. The process can also produce high-grade tantalum powder from virgin ore. Samples of reclaimed powder are being evaluated by several tantalum capacitor makers. Although the evaluation has not yet been completed, results so far indicate that the powder seems to be of good quality.

67-0993

Recovery of epsilon-caprolactam from trichloroethylene waste. British Chemical Engineering, 12(11):65, 1967.

A new process for recovery of epsilon-caprolactam from trichloroethylene waste overcomes the shortcomings of the old method such as low quality and high loss. Its basis is a ternary equilibrium diagram for the system caprolactam-trichloroethylene-60 percent sulfuric acid. The process recovers caprolactam by extracting waste trichloroethylene, and the caprolactam A neutralizing operation treats the trichloroethylene and the caprolactam is recovered by a salting-out operation after a Beckmann rearrangement. A diagram is included.

67-0994

Reducing the cost of handling scrap. Waste Trade World, 110(3):13-14, Jan. 21, 1967.

The reduction of operation costs by the use of bulk container systems which allow materials to be dumped directly into containers instead of on the ground to be uplifted again, is discussed. The pre-loaded containers can be removed by the container handling equipment, which exchanges an empty container for the loaded one and transports it to the disposal area. The container equipment can be driven and operated by one man and the system is economically feasible for small companies in their waste handling. A further advantage of containers with scrap metals is that different materials can be segregated and placed into appropriate containers for further processing. In another method, the handling vehicle can travel along a route of containers, instead of having to transport each container to the disposal point, emptying the contents of each into the body of the vehicle where compaction rams reduce the volume and enable the collection of a large amount of material. Work study surveys made on container systems have shown that it is possible to offset the capital outlay involved in 1 to 3 years, without taking into account the many additional benefits to be gained from these systems. Tabulated data present in detail the economics of a container system compared with those of a conventional tipper-bodied vehicle.

67-0995

Refuse is the sweetest fuel. American City, 82(5):116-118, May 1967.

Refuse is an apt fuel for power generation when burned in municipal incinerators because: large amounts are available; its disposal is costly; its calorific value is adequate; and techniques can now eliminate air pollution. A symposium entitled 'Incineration of Solid Wastes' was sponsored by the Metropolitan Engineers Council on Air Resources (MECAR). Refuse is 1/3 paper and only 1/8 food. Moisture content varies. The sulphur dioxide emission is low because the sulphur content is low. Electrostatic precipitators are being installed because of their excellent particulate-control characteristics. Alan Walker, technical director of Research-Cottrell explained, 'A strict emission code of 0.2 lb will result in visibly clear stack emission so long as there is more than 150 percent excess air in the stack.' New York's commissioner of sanitation wants a shearing device to cut heavy materials into 3-ft lengths for easy incinerator reception. Industry should develop new types of beer cans and other containers that can be disposed of more easily. Other subjects of discussion were: 'Refuse Steam Generator' by Dr. H. Carleton Moore; 'New Incinerator at Munich, Germany' by Georg Stabenow; 'Incinerators with Refractory Furnaces' by Leonard Wegman; 'Economics of Solid Waste Incineration' by Leroy F. Deming; and 'Industrial Incinerators' by Charles Hescheles.

67-0996

Refuse rocket fuel. ASCE [American Society of Civil Engineers] Newsletter, Sanitary Engineering Division, (51):7, Nov. 1967.

A new rocket fuel composed primarily of human wastes has been sucessfully test fired by a rocket research corporation. Known as Monex W, the new fuel is intended for future use aboard large manned spacecraft which remain in orbit for extended periods. Fuel ingredients include feces, paper, garbage, and wash water. Developers of the fuel point out that one of the most intriguing aspects of the study is the possibility of using Monex W in case the primary propulsion system fails. Spacemen could then make this new fuel on the spot to return the craft to earth.

67-0997

Renken, H. C., J. R. Burke, and R. W. Schatz. Recovery and utilization. In Status of unit operations and processes for solid-waste disposal; final report. Columbus, Battelle Memorial Institute, Feb. 19, 1967. p.43-82.

A state-of-the-art survey was conducted through interviews, visits, and a literature search. A proposed system is described for the disposal of municipal garbage and refuse that features the recovery of nonferrous and ferrous scrap, aluminum scrap, glass, plastics, rubber, rags, and paper by hand sorting and magnetic separation. The separation and recovery of waste wood, wastepaper, bark, bagasse, glass, and stone are briefly covered. The capital investment in equipment for fly ash collection and the annual cost of operating electrostatic precipitators are tabulated. Various types of slags are currently being processed and marketed for use in glass and fiberglass manufacture, soil conditioning, fertilizers, highway surfacing, and concretes. Special attention is given to the scrap metal industry including: sources and marketing; sorting and preparation; recovery of nonferrous metals such as copper, zinc, uranium, and yttrium; and production of marketable metals by melting, refining, smelting, distillation, and hydrometallurgical processes. Data are tabulated for non-ferrous scrap recovery in the United States and scrap-metal price quotations are given.

67-0998

Rolt, L. T. Riches from a slag tip. Bulletin of the Institution of Engineers, 16(12):1-2, Aug. 1967.

A process developed by the British Iron and Steel Research Association, by which an entirely new construction material of high quality (Slagceram) can be produced from slag, is described. By adding extra sand to blast furnace slag to bring the silica content up to 45 to 65 percent, a crude form of glass called 'Vitroslag' can be produced by the normal processes of glassmaking. If Vitroslag can be given a uniform crystalline structure, it becomes a superior material. This has been achieved by adding to the melt an agent, such as an oxide of vanadium, chromium, titanium, and iron, as well as some fluorides and phosphates, which will promote crystallization. The production method is the same as that for glass, except that a carefully controlled heat treatment process takes the place of the usual annealing of the formed material. Fine or coarse grained material can be produced which has high crushing strength and abrasion resistance and is much harder to scratch than good ceramic tile. It is more elastic and heat resistant than glass, has a very high electrical resistance, does not discolor in the atmosphere, and will not grow mold. Slagceram may be polished like granite, it may be cut by a diamond-edged saw, and it can be mounted in conventional cements as well as in more expensive epoxy resins. Vitreous enamel can be applied before heat treatment, which saves money.

67-0999

Salvage plays key role for Scottish City. Refuse Removal Journal, 10(1):26, 27, 46, Jan. 1967.

Except for trade waste taken directly to a landfill, all municipally-collected waste in Falkirk, Scotland, is screened for its salvage value. Food waste is sold to pig farmers. Household refuse is collected twice weekly. Clean newspaper and old corrugated paperboard are separated for salvage. Grass wastes are taken to a compost heap. Most old furniture is burned and salvable goods are sold to second hand dealers. General refuse to be incinerated is dumped into a hopper and separated on a vibrating screen. Ferrous metals are removed by a mechanical magnet, baled and sold. Clinker from the incinerator is taken to a landfill, but siftings less than 1½ in. are used for top dressing landfill and mixing with soil. Screens, baffles, and water control the units' air pollutants. Corrosion, however, is a problem. Landfills are now parks and athletic fields. Multi-story buldings are often provided with large paper or polyethylene sacks to save clean waste paper. Falkirk provides every home with a specially designed refuse can, paid for on the city tax.

67-1000

Salvaging profit from waste. Chemical Week, 101(12):109, Sept. 16, 1967.

Swanson & Associates, a 16-man research and development concern, is concentrating on developing useful products from food processing wastes such as bran, cheese, whey, eggshells, and brewer's yeast. The concern is interested in developing methods and not in production. The problem of waste bran (Pillsbury alone has an annual production of 900 million lb) seems to have found a solution in the simultaneous polymerizing and molding of waste bran under heat and pressure to give a coarse brown plastic. In the frozen food market, these vessels could be taken from the freezer to the oven without cracking and then used as disposable serving dishes. The process would increase the price of bran from 2 to 10 cents a pound at a cost of 6 cents. By converting cottage cheese whey into protein and lactose, the objections of water-pollution officials to the dumping of whey will be eliminated. The method involves putting the whey through a version of the molecular sieve which is capable of six cycles per hr to give a 50 percent lactose and 23 percent protein yield. For an investment of $900,000, a whey conversion plant can handle a million pounds a month with a $75,000 a month pretax profit. It is hoped that a variation of this whey process might work out on used-up yeasts and other beer wastes. He also hopes to develop a product from wastes from another industry with eggshells to make a thermosetting insulation costing one-sixth as much as polystyrene foam.

67-1001

Scrap and waste conference and exhibition. Iron and Steel, 40(10):399-401, Sept. 1967.

A paper, 'The Treatment of Swarf in the Engineering Industries', presented by R. E. Turrell at the Scrap and Waste Exhibition and Conference, is summarized. The handling and treatment of swarf for reclamation are described. Cast iron swarf has usually been machine dried, producing dust or small chips which create no problems for manual removal or for conveyors since the graphite from the cast iron forms a very good lubricant. Small amounts of lead are sometimes added to mild steel to assist in swarf breakup, but in most cases the swarf is produced in curly or bush form. Short curly swarf can be handled easily by conveyors but bushy swarf is often left to accumulate into large balls which can be forked out of the machine. The swarf is taken to a treatment house and the cutting oil is returned to a filtration plant for treatment and reuse. A diagram of a swarf reclamation plant is shown which includes an Ellerwerk continuous centrifuge, a crusher, a heating tank, dirty oil tanks, a purifier, and a fines grid. When the swarf is received by the treatment house it is 'teased out' to eliminate foreign matter and to drain off the excess coolant. It is then fed to a crusher and the small chips so produced are passed into a centrifuge where the coolant is extracted and piped into a tank for reclamation and the dry swarf conveyed to lorries or railway wagons. The advantages of treating the swarf are that its price is double that of untreated swarf and the saving on oil reclamation is considerable. Two methods for treating oil for reclamation and reuse are described.

67-1002

Scrap and waste conference and exhibition. Iron and Steel, 40(10):401, 403, Sept. 1967.

A paper, 'Latest Handling Methods for Scrap and Waste', presented by F. Dyer, W. M. Jacques, and K. J. Jennings, at the Scrap and Waste Conference and Exhibition, is summarized. In the steel industry the handling of scrap and waste products is more extensive than often realized and constitutes a high percentage of the total cost of operation. A number of advantages of mobile equipment for such handling, especially where a variety of jobs have to be done, are listed. Some of the many improvements that have been made over the past few years to simplify operation and maintenance of a mobile plant are mentioned. Overhead cranes, fork lift trucks, and conveyors are briefly described. The overhead crane occupies no floor space and covers the maximum swept area of all appliances as well as allowing full area storage, often to a considerable height. The fork lift truck is a valuable link in the chain between recovery and reuse of scrap and waste, and can be fitted with a rotating head which enables it to handle bins of scrap and to empty them by rotating the forks. Three types of conveyors are mentioned which can be used for handling all forms of scrap from light turnings and swarf to sheet turnings and off-cuts.

67-1003

Scrap and waste exhibition. Machinery and Production Engineering, 111(2858):381-383, Aug. 23, 1967.

Statistics released at a recent Scrap and Waste Exhibition in London emphasize the importance of salvaged basic material to the national economy, by the reduction in imports of metals, rubber, and paper. Scrap residues furnish 40 percent of the copper, 36 percent of the aluminum, 23 percent of the zinc, and 51 percent of the lead consumed in the United Kingdom. There were several new swarf handling machines at the exhibition. Broadwell Engineering Ltd. exhibited a compact dual purpose plant for crushing swarf and recovering cutting oil capable of one-man operation and economically justified for 1 ton or more per hour. Compacted oil-free swarf with a resale value of £6 per ton is worth double the untreated oily swarf. Most of the cutting oil can be recovered by centrifuging and clarifying for further use. The plant consists of a crusher, an Ellerwerk continuous type centrifuge, oil tanks, and short conveyers. The most advanced plant, Mk 3, crushes the swarf and separates and clarifies the mixtures of high grade cutting and soluble oils. An illustration shows the new Broadwell Univeyor designed to handle dry or oily swarf; hot, abrasive, and lumpy materials; and boxes, sacks, and forgings generally unsuitable for conventional conveyors. Also shown is an illustration of the Eldair 2A stationary scrap baling press designed to eject bales ranging from 12 by 12 by 4 in. to 12 by 12 by 8 in. automatically through a hydraulically-operated door. Also illustrated is the Eldair 300-ton hydraulically-operated scrap shear machine designed for a variety of scrap.

67-1004

Scrap as a source of metal. Waste Trade World, 110(6):10-11, Feb. 11, 1967.

Mr. K. Romer-Lee, director of the British Non-ferrous Metals Federation, gave a talk on 'Copper--a consumer's point of view' at the monthly luncheon meeting at Edgbaston, England. The two main points covered were scrap as a source of metal supply and the relationship between the scrap market, scrap prices, and the world market for copper. Since Britain now has no domestic copper mine production, scrap reserves are the only source of copper near at hand and not subject to sudden political or industrial interruptions. It is therefore important for consumers of copper to use scrap metal as much as possible. He also commented on the world market, indicating that the major part of primary copper production is in the hands of a small number of copper mining companies throughout the world. When the producers control the primary metal price, as they have done from time to time, it is the scrap and secondary metal which provide the marginal market. In times of shortage, increases in demand are concentrated on the scrap market, causing free market prices for marginal metal to go up to £800 per ton when the producer's price was £336. He also commented on market prospects of raw copper.

67-1005

Scrap baling presses. Machinery Market, 1967(3463):27-28, Mar. 30, 1967.

A new range of hydraulic scrap baling presses, designed to deal with all classes of light scrap, are described. These 'Eldair' models operate with a time cycle of 40 seconds and offer a choice of 12-in. or 8-in. cube blades. The presses are available either as portable or static units weighing about 12 tons, and may be driven by either diesel or electric motors of 30 or 40 hp. A photograph of one of the presses is given.

67-1006

Scrap charging machine. Machinery Lloyd and Electrical Engineering, 39(17):15, Sept. 2, 1967.

The large capacity scrap charging car used by the Consett Iron Co. Ltd. to feed material into LD and Kaldo converters is described. The manufacturer of the scrap car was Ashmore, Benson, Pease and Co. Ltd., of Stockton-on-Tees, Durham, under a license from the Pennsylvania Engineering Co. of the United States. Each of the two scrap boxes with which the car is equipped has a normal scrap capacity of 22.5 tons, although the car can transport and discharge 80 tons of scrap to the converter. A picture is shown of the charging car in operation during trials at the South Works of Ashmores. In operation, the pans are filled with scrap near the converter platform and placed on the car simultaneously by the plant crane. The car, which can travel at 150 ft per minute, can dump two pans of scrap into one converter in 100 seconds (maximum charging rate is 48 tons per minute). The prime motive power is a Rolls-Royce six-cylinder diesel engine. All car motion is hydraulically operated and the pans are moved by cylinders. The advance circuit of the hydraulic system is fed through a valve operated by cams located along the rails on which the car moves, so that a pan can only be discharged when it is in line with the converter. When a pan is in discharge position, a colored light on the control panel in each of the two cabs is lit and when a pan is discharging material, the car cannot be moved.

67-1007

Scrap conveyor ups efficiency. Factory, 125(2):149, Feb. 1967.

A pushbutton conveying system sucks metal chips and shavings away from machinery and deposits them in hoppers. The scrap is then dumped into a briquetter where it is compressed by hydraulic ram (2,500 psi) into salable briquettes. Time and cost are reduced by the system.

67-1008

Scrap handling and processing. Steel Times, 195(5165):49-52, July 14, 1967.

Although the introduction of hydraulics to shearing and baling, and the introduction of pulverizing/shredding techniques have been responsible for great progress in scrap handling much has also been accomplished by greater resource to mechanization and adaption of material handling techniques to the scrap processing industry. The hydraulic shear changed the processing of heavy scrap from a labor-intensive industry to a capital-intensive one. Photographs show a mobile crane with a 4-ton capacity on a 9-ft radius, a hydraulic alligator shear, a general purpose scrap-baling press capable of baling scrap from cans to auto bodies, a Huge Haul detachable body transportation system, an 11-ton mobile crane, a Lindemann press, and a Dinosaur dump truck. One shear has a capacity to cut mild steel plate 4 in. thick by 34 in. Hydraulic shearing and baling facilitate the production of highly uniform, densely compacted bundles for blast-furnace consumption. All of the equipment described and illustrated was exhibited July 17-22, 1967 at the International Scrap and Waste Exhibition at Olympia, England. Exhibits from nine industrial countries will be shown and demonstrated. There will be 3 days of technical conferences covering the major aspects of handling and recovery operations. The papers and exhibits should give a broad picture of the state-of-the-art at the present time.

67-1009

Scrap processing by contract. Comprehensive facilities speed LD charging at Spencer works. Iron and Steel, 40(13):522-523, Dec. 1967.

The facilities for handling scrap at Spencer works are described. Scrap Processors Ltd. were contracted to process scrap and an enclave was created within the perimeter of the works into which come all the sheet trimmings, recovered skulls, and bought scrap, which emerge as fully processed scrap in special containers for immediate charging. The site consists of two parallel gantry bays, 400 ft long by 88 ft wide. One bay handles all the incoming material which requires chopping and is served by two 15-ton overhead cranes which empty the trucks and feed two Lindemann shears at a total rate of 50 tons per hr. Other equipment on the incoming side includes an electrohydraulic baler, with a capacity of 40 tons per hr. The other bay is for loading purposes with four special trailers, capable of carrying loads up to 150 tons and towed by diesel engine tugs. It is also served by two 15-ton overhead cranes. The tug unit traverses a roughly oval course through the plant, along which it picks up a load of 60 tons or more of scrap which can be placed in the furnace in a few minutes after the scrap boxes have been lifted by crane up to a Wellman charger unit. Remaining items of equipment are four weighbridges, two of which are situated along the tug unit route, with another for weighing incoming road scrap, and the fourth for weighing incoming wagon material. The overall input into the steel plant is at present about 11,000 tons per week, with a maximum expectation of about 20,000 tons per week. The men working at the plant are credited with 50 percent of the value of any non-ferrous material recovered from the scrap, which helps to cut down the amount of tramp metal. Some advantages of using a special scrap handling plant of this kind are mentioned, including increase of steelplant yield.

67-1010

Service, G. Groundwood from sawdust. Pulp and Paper Magazine of Canada, 68(6):118-121, June 1967.

A technical analysis of the conversion of sawdust into groundwood for newsprint is described. Operating details and results achieved by a large-scale production unit in Canada are presented. Descriptive sections include the screening and cleaning system, the reject handling system, instrumentation, sawdust and pulp quality, and future plans. The sawdust, or preferably, small chips, are obtained from sawmill gang saws and edgers in two sawmills adjacent to the pulp and paper mill. Flow diagrams of the operation are given and properties of the groundwood are summarized in tables.

67-1011

Sewage sludge: PHS backs a soil fertility project. Oil, Paint, and Drug Reporter, 191(26):5, June 1967.

A project to explore the possibility of piping processed liquid sewage sludge directly to improve the soil fertility of farmlands without endangering human health is described. The experiment is expected to run for 3 years at a total cost of $914,000. Projected disposal of as much as 75 tons per acre a year is expected to cost about $15 a ton. If the experiment proves successful from the standpoint of health safety and soil improvement, Chicago may solve a major environmental sanitation problem.

67-1012

Sheldrick, M. G. Better use of wastes spurs commercial application of hot briquetting. Chemical Engineering, 74(25):140-142, Dec. 4, 1967.

At Chevrolet's Tonawanda, New York, gray-iron foundry, turnings and borings that formerly were sold as scrap are converted into pillow-shaped briquets that weigh about 4 lb each. These briquets are easily handled and shipped and can be used as charges to furnaces and other processing vessels. First, the turnings and borings are covered with oil to provide fuel for heating. Incoming feed is tumbled with finished briquets to conserve heat and the mixture is screened to remove the briquets which are ready for further processing. The preheated feed is then charged to a furnace, maintained at a temperature between 1,500 and 2,000 F, which brings it to the required temperature for hot briquetting. In the briquetting machine, a feeder accurately meters the material and at the same time forces it between the rolls, permitting higher compaction pressure and a more uniform product. Briquets are formed as the material is forced between the indentations on two rolls that rotate in opposite directions. The machine produces up to 40 tons per hr of briquets at a total cost which varies from a few cents to several dollars a ton, depending on the material. Recent improvements in briquetting machines are mentioned, including the replacement of spring roll-pressurizing systems with hydraulic systems, the use of extremely durable alloys for rolls, and a segmented roll design.

67-1013

Slagceram, a new construction material. Journal of Scientific and Industrial Research, 26(4):182, Apr. 1967.

An article in Chemy Ind. (42:1966) is briefly summarized. Slagceram is a construction material, developed at the laboratories of the British Iron and Steel Research Association, which is based on the controlled crystallization of slag-based glass. It can probably be used in a variety of road and building materials such as curbstones, paving flags, floor and roof tiles, drain pipes, wall panels, and non-skid road surfaces. Pilot studies suggest the following stages in full-scale plant production: adjustment of slag composition to give a glass suitable for crystallization, shaping of the glass into the final product, and a two-stage heat treatment of the article to convert it into Slagceram. Conventional glass-making furnaces and casting and shaping processes can be used with suitable modifications. For heat treatment, the continuous annealing furnaces, with provisions to give the required temperatures of 650 to 750 C for nucleus formation and 900 to 1,100 C for crystallization for several hours, might be used.

67-1014

Sobel, W. H. Efficient scrap yard layout. Waste Trade World, 111(7):14, Aug. 12, 1967.

Careful advance planning by the scrap yard owner, the architect, and the building contractor are necessary to integrate the scrapyard into the urban planning for the whole community. Scrap yards do not have to be eyesores, nor do they have to be a source of air and water pollution. In the advance planning, when a new site is to be opened up or when new processing equipment is acquired, the owner should have legal, accounting, and insurance counsel. His architect should be backed up by engineering specialists, such as civil, structural, soil, mechanical, electrical, and landscaping. The initial written program should describe the needs, the methods, and the past, present, and future goals of the owner. After the initial program is reviewed, the traffic patterns are plotted which cover the roads, tracks, cranes, and other material handling equipment and facilities. Possibly in the near future scrap processors may follow the lead of the automobile manufacturers, where scrap is dropped to underground conveyors for movement over long distances to balers, shredders, or shears. The final step includes studies of the locations for fixed equipment, buildings, warehouses, storage, and employee facilities. All of the designs and plans should be checked with the local and State building authorities. When cost estimates have been approved, the working drawings may be started.

67-1015

Solid wastes. Environmental Science & Technology, 1(3): 199-202, Mar. 1967.

Several ways in which society can meet the problems of solid waste disposal are explained. The efficiency of processes for the recovery of metal scrap from automobiles is discussed as is the possibility of obtaining products useful in steelmaking from zinc mining and milling waste. Also mentioned is that the use of dust generated in washing coal can improve gypsum, concrete, and other building materials. The fact that fly ash in the correct proportion makes concrete stronger and more resistant to freezing and thawing was presented.

67-1016

South African pulp mill uses coal/sawdust firing. Engineering and Boiler House Review, 82(9):267-268, Sept. 1967.

The South African Pulp and Paper Industries at Ngodwana, in Eastern Transvaal, has a boiler plant which is designed to supply process steam for the pulp and paper industry by waste-fuel firing of sawdust/coal mixtures. A photograph shows the boiler in the process of erection together with a half-section drawing showing the construction of the unit. Since steam available from a chemical recovery furnace can vary greatly, the sawdust/coal recovery furnace which provides the balance must be capable of meeting rapidly, widely varying loads. The bi-drum boiler has a heat release of 18,250 Btu per sq ft at mcr when firing coal with a total boiler generating surface of 9,500 sq ft and a water wall surface of 2,850 sq ft. The boiler is designed to burn from 50 to 100 tons per day of pine sawdust as an alternative fuel. The sawdust, produced in the pulp making process, is a reject which, after passing a ¼-in. mesh on a vibrating chip screen, is fed to storage hoppers for feeding to the sawdust burners. The sawdust is injected into the furnace with most of the sawdust burned in suspension above the grate. The boiler has an efficiency of 83.8 percent with coal and 77.3 percent with a mixture of coal and sawdust. Thirty-five percent of the heat input to the boiler is supplied by the sawdust. The waste-fuel firing is the key to the production of paper pulp by supplying the energy demands by the use of reject sawdust.

67-1017

Srinivasan, V. R. Development of single cell proteins from cellulose substrates. In The development of food from cellulosic waste for human and animal consumption. Baton Rouge, Department of Chemical Engineering, Louisiana State University, July 1967. p.8-13.

If proper strains of microorganisms are selected so as to allow them to grow on treated or biodegraded cellulosic wastes, this would prove to be an efficient mode of conversion of cellulose to nutritive proteins. The specific aims of investigation are to isolate and identify cellulose digesting microorganisms, study the growth of these organisms in the presence of cellulose and derivatives of cellulose, and study the optimal conditions of cellulase production during growth. Two promising microorganisms have been developed which will rapidly induce the enzyme cellulase to cleave the cellulose chains into simpler molecules. These low-molecular weight components will serve as substrates for subsequent production of single cell or yeast proteins. Sufficient quantities of these organisms are being prepared for analysis of the amino acids present in the protein as well as the whole organism. A mixture of rotting sugar cane and soil from an L.S.U. cane field was used as the source for the isolation of cellulolytic organisms. The organisms were enriched by allowing them to grow in the presence of filter paper which is a pure form of cellulose. Then standard microbiological techniques were used to isolate pure strains and identify and classify them into known taxonomical groups.

67-1018

Steam load held on wood waste. Engineering and Boiler House Review, 82(7):205-206, July 1967.

A description is given of the steam plant in a North London furniture factory which is fed automatically with wood waste and coal, either separately or mixed, at an annual saving of £1,870 over the old installation. Previously, two 30-by-7-ft Lancashire boilers were handfed with trash and coal. In the new installation, the wood storage unit receives sawdust, shavings, and chips from the hogging machine. A rotating chain delivers the wood fuel to the suction chamber for mixing with the coal at the coal-conveyor (illustrated) for delivery to the two GWB Vekos Powermaster boilers with a capacity of 10,000 lb per hr (illustrated). The hogging machine handles waste up to 4½-ft lengths in a chamber with 14-in. brick walls and a 6-in. concrete roof to control the noise. The plant has run on wood waste alone for 4 months. A detailed flow sheet is given showing the pneumatic conveying system and the detailed flow sheet is given showing the pneumatic conveying system and the arrangement for delivering wood or coal or a wood-coal mixture to the boiler. The savings in pounds include fuel--£2,207, maintenance--£-400, and labor--£250; while the increased costs include power--£837, and unburnable material--£150. The total savings are £2,857 and the increased costs are £987, for a net saving of £1,870. It is anticipated that in 12 years annual savings will pay for the new plant, which is the first automatically-fed waste wood and coal-fired boiler in Great Britain.

67-1019

Stone, E. J., and C. D. Callihan. Utilization of cellulose substrates, and single cell and yeast proteins for animal feeds. In The development of food from cellulosic waste for human and animal consumption. Baton Rouge, Department of Chemical Engineering, Louisiana State University, July 1967. p.48-58.

Efforts have been made to utilize bagasse, various straws, and wood by-products as animal feeds, with relatively poor results. Lignin and the crystalline structure of the native cellulose itself both prevent digestion in the ruminant stomach. Recent research has shown that the digestibility of bagasse and rice straw can be increased by alkali treatment prior to feeding. Results of this investigation are briefly reviewed. Objectives for proposed research include: directing pilot unit operations for the production of high-quality ruminant feeds from low-grade cellulosic materials; making available test animals for feeding studies; conducting feeding studies using chemically treated cellulosic materials and microbial protein; and formulating and developing a highly nutritive, low-cost feedstuff for ruminants that could be produced anywhere low-grade cellulosics are available.

67-1020

Super shredders need hands for quality control. Waste Trade World, 111(22):5, Nov. 25, 1967.

Although mechanization of scrap yards has now reached the stage of super shredders, there is also an increasing emphasis on hand sorting. More than 40 shredding machines ranging in cost from $300,000 are operating or being installed by scrap processors. At the same time, hand operations are being employed in many yards to exercise tighter quality control. Disassembly lines for motor blocks are being set up in yards in which the blocks move along conveyors as crews with air tools and hammers strip them. After the block is cleaned, a guillotine shear breaks it into the proper size. A more elaborate hand-stripping operation involving a 12-man crew stripping 20 cars at a time, after burning, has been developed to the point where all non-ferrous material, wiring, and non-metallics can be removed from a car in less than 5 minutes.

67-1021

Swanson, E., and J. V. Ziemba. Seek more profits from plant wastes. Food Engineering, 39(7):110-112, 114, 117, July 1967.

A molecular-exclusion process based on a molecular sieve concept is described for the commercial recovery of edible proteins from whey, a waste product which is difficult to treat. Basically, the method used is a modification of column chromatography which is less precise and time consuming. Laboratory work has been carried out on 150-ml samples, but the minimum capacity for a commercial application would amount to 0.5 million lb of whey solids a month. The initial raw material will come from lactose producers of whey effluents with cheese factories as a secondary source. Cheese plants in the United States now produce 1.3 billion lb of whey solids annually, most of which are sold at less than 5 cents a lb as animal-feed supplement. The whey is passed over cross-linked plastic material with just the right porosity, thus trapping the smaller molecules and allowing the protein to pass. Product streams are taken off at selected points to obtain the desired product. A flow sheet and table show the composition of the streams as: (1) Product 75 contains 75 percent protein, 22 percent lactose, and 3 percent minerals. (2) Product 50 contains 50 percent protein, 44 percent lactose, and 6 percent minerals. (3) The lactose stream contains less than 1 percent protein and minerals and 99 percent lactose. (4) The salt stream contains 10 percent protein, 20 percent lactose, and 70 percent minerals. The proteins which are the same as the lactal albumins and globulins in milk can be blended into a variety of other foods. The value of the products from 1 million lb of whey solids is estimated to be $162,070.

67-1022

Swarf crushing and oil reclamation plant. Engineer, 224(5826):387, Sept. 22, 1967.

The Broadwell swarf treatment plant, designed to process 1 ton per hr of steel turnings, is described. The crushing and oil recovery plant, which is illustrated, is supplied as a self-contained packaged plant of two-level construction and open design to give free access to all parts. The swarf receiving platform on the second level is inclined to allow oil drainage to flow through a mesh filter into the dirty oil storage below. The swarf is fed by the single operator into a chute which feeds an Arboga slow-speed, vertical crusher. Swarf under 3 in. in length is forked by the operator through a grid to a screw conveyor which feeds the centrifuge directly. A rotating head carrying one long arm and two short stub arms in the upper chamber of the crusher feeds the turnings down as they are ripped into small pieces before delivery to the crushing zone between a rotating and a stationary ring. From the base of the crusher, the chips are fed to the feed chute of an Ellerwerke continuous centrifuge by a bucket elevator. The oil removed from the swarf flows from the centrifuge into a dirty oil tank and the chips are discharged from the plant by a screw conveyor. The dirty oil is filtered and pumped to storage. Another version of the plant processes only high grade cutting oil, and another purifies a mixture of high grade cutting oil and soluble oil. These plants incorporate a centrifugal oil purifier which delivers clean oil to storage ready for reuse.

67-1023

Swedish waste paper collection increases. Waste Trade World, 111(5):6, July 29, 1967.

Statistics are given on the collection, use, and disposal of waste paper in Sweden for 1965 and 1966. The 300,000 tons collected in 1966 were 20,000 tons more than in 1965 in Sweden; this represents 25 percent of the consumption of paper and board in 1966 (approximately 1,220,000 tons). The domestic paper and board industry took 189,000 tons of the 1966 salvage and the remainder was exported. The Swedish paper industry retains only 6 percent of its fiber waste paper, which is far lower than usual in the paper industries in Western Europe and the United States where the main use is domestic. The types of paper which predominate in Sweden, such as newsprint and kraft, do not use waste paper as a raw material.

67-1024

Textiles from used tires. Waste Trade World, 111(23):3-4, Dec. 2, 1967.

The Hungarian Palma technique, whereby used tires are broken down and sorted into rubber granulate and usable textile material, is described. This efficient and cheap process, developed in 1962, proved so successful in its yields of industrial raw material from used rubber tires that it was set up in full production by the Hungarian industry in 1964. First, the tire passes through an edge remover which cuts off the beading containing the wire, followed by a cutter and storage container batcher, which chops the tire with maximum economy and yet ensures that best use can still be made of the textile parts. Next, the material is passed through the grinder and textile separator equipment which sorts it into three categories--two forms of granular and one of textile material which is recovered undamaged and clean. The textile is then passed through a shredder for efficient separation of the cord yarn. The granulate can be used for the production of high-grade rubber bitumens, the crumb for the dry-drip or Banbury process or for production of flexible carpet underlays, and the textile for loose felting, quilted interlinings, sound or heat insulating boards, upholstery stuffing or sheet, and baling.

67-1025

Thiesmeyer, L. R. More and more for less and less. Forest Products Journal, 17(9):43-47, Sept. 1967.

Utilization of the whole tree in the paper industry, including parts now considered as waste, such as bark, branches, roots and foliage, as well as extraction and marketing of a host of by-products to be made from liquid and solid wastes, is discussed. The possibility of producing synthesized gases from the organics in spent liquors, in tonnage quantities which could be used for the manufacture of secondary products, is being studied at the Pulp and Paper Research Institute of Canada. A new and more efficient bleaching procedure for pulp is described. The pulp is treated with chlorine and chlorine dioxide in gas form, and is extracted with ammonia used as a gas. In only four stages of reaction and extraction, an unbleached kraft pulp can be brought to a G.E. brightness of more than 90. The reactions are rapid, requiring only minutes rather than hours. It is concluded that, with the utilization of waste products and technological advances, the future of the paper industry is bright indeed.

67-1026

Tipping site caused bottlenecks. Waste Trade World, 111(15):12, Oct. 1967.

Two static HIAB 177 Speedloaders each with a capacity of 19.5 cwt, and a radius of 16 ft 6 in., were installed by W. F. and J. R. Shepherd in Newcastle upon Tyne in order to eliminate bottlenecks in feeding of metal to the press. Prior to the installation of the Speedloaders, the metal cuttings had to be unloaded as close to the baler as possible, which necessitated long waits for the trucks when the tipping site was full. Now the material can be unloaded at any point within the radius of the Speedloaders so that the waiting time is eliminated. One Speedloader fitted with a cactus grab is used for feeding the swarf crusher with metal turnings which are dropped beside the hopper and then hand-fed to the hopper by two men. Hand feeding is essential to eliminate large pieces which might be dangerous to the crusher. The other Speedloader handles mixed light cuttings for a 12-by-12-in. baler. Feeding of the swarf crusher now requires only three men instead of five, and the capacity is increased from 40 to 100 tons per week. In feeding the baler, three men worked 3 hr to clear 8 tons of mixed light cuttings, while with the Speedloader it takes two men less than 1 hour.

67-1027

200-350 tons of tin salvaged monthly. Refuse Removal Journal, 10(11):26, Nov. 1967.

Tin cans are separated from household refuse in four sanitary landfill operations near Sacramento, California. Each site recovers 200 to 250 tons of tin cans per month, and by salvaging the copper, revenue is said to run as high as several hundred dollars per month. Magnetic separators separate the cans as raw waste is feed into them by track-type loaders. Removal of tin cans makes subsequent refuse compaction easier and may result in longer useful life of the landfill.

67-1028

Unique system turns out scrap bale per minute. Modern Power and Engineering, 61(6):75, June 1967.

The continent's largest hydraulic system, used to drive a scrap baler, is described. Sixteen 90-gal per minute pumps operating at 2,000 psi generate a force of 1,200 tons to actuate the hydraulic rams. These rams compress scrap metal into bales destined for open hearth furnaces. Another two pumps supply makeup oil from the system's holding tank while two pilot pumps supply streams of oil for directing main oil flow through the system. Light viscosity oil is used because of the high speed and pressure involved and the small pump clearances. This oil has a viscosity of 115 SSU at 100 F and is fortified with a mild EP additive to prevent scuffing and welding, and also with rust and oxidation inhibiting and anti-foam agents.

67-1029

Use of alumina sludge. Chemistry Oil and Gas in Romania, 1967(3):45, 1967.

Following studies undertaken at the 'Transylvania' chemical works of Oradea, a semi-industrial plant has been commissioned for the manufacture of red oxide from the sludge resulting from the technological processing of alumina. Red oxide can be used in oil paints, glue, interior decoration, synthetic resins, and for protection against corrosion.

67-1030

Utilization of second-hand industrial equipment. Journal of Scientific and Industrial Research, 26(4):143, Apr. 1967.

A Report of the Expert Group on Second-hand Equipment for Developing Countries is briefly summarized. The report states that considerable quantities of second-hand equipment with potentialities for use in developing countries are generated in industrially advanced countries. Such equipment may be essentially unused, reconditioned, or available for sale as taken from service. The principal causes for the generation of such equipment are modernization, automation, closing of plants and mergers, government surpluses, obsolescence and physical deterioration. Equipment falling within the first four classes is not obsolete and could be of special interest to developing countries. A number of advantages of second-hand equipment are listed, including its acquisition at a cost considerably lower than that of new equipment. Disadvantages are also outlined, including some objections given by developing countries against the use of second-hand equipment. It is suggested that care needs to be taken in selecting the appropriate equipment for use in a given country. However, it is difficult to obtain information regarding the technical and economic aspects of second-hand equipment. The report suggests that suitable agencies in developing countries be set up to collect and catalog data about the type of equipment needed, and that similarly, in developed countries, data on the type of equipment available should be collected and distributed to prospective users.

67-1031

Wachter, J., and K. Baum. Three years of service of the sewage gas power station at the main sewage plant at Koehlbrandhoeft in Hamburg. Gas und Wasserfach, 108(20):574-577, May 1967.

The sewage plant produces about 1,000 cu m gas per hr which is utilized by three gas engines of 1,400 hp each. The 6-kV three phase asynchronous generators each yield 0.95 MW electrical power. A detailed description of the electrical installation linking the power station with the network of an electrical company is given. The total average consumption of electrical energy of the sewage treatment plant was 6.6 times 10 to the sixth kw per year, and 13.0 times 10 to the sixth kw per year was produced. Because of repairs and irregularities of the gas production, only 52 percent of the power capacity was utilized on the average. A calculation of costs concludes this paper. (Text-German)

67-1032

Waste converted into space fuel. Industrial Research, 9(3):32, Mar. 1967.

Propulsion systems sponsored by the National Aeronautics and Space Administration that can use waste products for fuel are described. The Marquardt Resistojet electric rocket engine can use liquid hydrogen to gain a maximum specific impulse (I) of 800 seconds, but it can also use waste wash water, urine products, or exhaled carbon dioxide as the working fluids. Although the impulse would be only 150 seconds, it would be enough to perform station keeping for a manned orbiting laboratory. In another project, solid fuel (Monex W) is made from a range of waste products such as feces, urine, food waste, paper, detergents, and toothpaste, which are blended with solid oxidizer and metal powder to form a gel. Monex W can provide effective rocket specific impulse of

400 lb seconds per lb and in some cases values as high as 800. Another use of solid waste fuel, based on expendable spacecraft structure such as fixtures, containers, and room dividers, has been proposed. Although the specific impulses of these waste product systems are lower than those of many of the liquid propellants available, they make up for lower performance by providing a more efficient spacecraft weight balance since they are lighter. Future ground applications are noted.

67-1033

Waste paper baler. Waste Trade World, 110(15):13, Apr. 15, 1967.

The Personer STD5A is a continuous hydraulic waste paper baler with two press chambers mounted side by side. One chamber can be filled while baling is taking place in the other. The machine is equipped with a double acting press cylinder to which is hinged the press platen. Twin press chambers of metal clad timber are served by the same top section comprising the hydraulic unit, cylinder and press platen, which pivots on a vertical shaft located between the press chambers and is located to the respective chamber during pressing. A micro switch prevents operation of the motor before the top section is locked to the chamber. The compressed bale is secured while the door is opened by wires or straps passed around the bale through special grooves in the press platen, and in the rear and bottom of the press chambers which, being slightly tapered, facilitate the mechanical removal of the bale by an automatic ejector during the return of the platen.

67-1034

Wastepaper recovery at Warrington. Public Cleansing, 57(11):612-613, Nov. 1967.

The 30 tons of waste paper and mixed waste (shoe and chocolate boxes, cigarette cartons, etc.), which are collected each week from industrial sources in Warrington, England, are transported to a depot and discharged directly onto the tail of the Wedco conveyor which is set in the floor. The conveyor utilizes a wire mesh belt of open weave which allows dust and other foreign matter to fall through onto a steel deck which lies just below the belt level of the section in the floor. A scraper arrangement automatically moves the foreign matter to a convenient point for removal. The material is elevated on the conveyor to a horizontal section at a convenient height for sorting. Contraries are removed and fiberboard is kept aside, because it brings a higher price when sold separately. After sorting, the mixed waste paper and cardboard are carried forward and elevated to a Powel continuous baler which automatically presses the material into bales weighing 1½ to 2 cwt each. A Powel Mark 6 baler, which will be installed in the near future, will produce bales of over 4 cwt each. This salvaging of paper reduces the spread of this type of material on refuse dumps and provides an income of approximately £12,000 per annum for the Cleansing Department.

67-1035

Wilson, D. A., and P. M. Sullivan. Recovery of lead and copper from blast furnace matte. U.S. Bureau of Mines Report of Investigations 7042. [Washington], U.S. Department of the Interior, Nov. 1967. 21 p.

About 58 percent of all lead produced comes from secondary sources and more than half of this arrives at the smelters in the form of scrap battery plates. A wide variety of equipment and smelting procedures is used in the secondary industry to recover this lead. The two methods that are relied upon most heavily are direct conversion into metal using a reverberatory furnace and smelting the battery plates in a blast furnace. A process was developed by the Bureau of Mines on a laboratory scale in which a solid waste by-product from refining of secondary lead was converted into three valuable products. Toasted lead blast furnace matter was leached with water to recover copper. This was followed by brine leaching to recover lead. Residues were finally smelted to yield pig iron. Copper recovery was 89 percent and lead recovery was 96 percent. The experiments and results are given with supporting data. Numerous illustrations and tables are furnished.

67-1036
Windaus, G., and E. Petermann. Investigations on the influence of solid fibreboard on the growth of plants. Das Papier, 21(5):225-239, May 1967.

Through the return of empty bottles, often large quantities of cardboard transport cases accumulate from wine growers. Since wine growing usually suffers from a lack of animal manure, it seemed worth while to investigate the possibilities of using crushed cardboard as soil conditioner. From the chemistry of cellulose, here briefly reviewed, it can be deduced that cardboard could supply nitrogen, would retain water, and fix nitrogen supplied by an artificial fertilizer. The nitrogen is liberated microbiologically from the cardboard by means of autolysis. Greenhouse experiments with various kinds of plants and types of soil proved that under certain conditions cardboard improved the growth. Optimal additions lay between 0.1 and 1 percent. Further investigations by field experiments are desirable. (Text-German)

67-1037
Yang, S. P. The role of single cell proteins in human nutrition. In The development of food from cellulosic waste for human and animal consumption. Baton Rouge, Department of Chemical Engineering, Louisiana State University, July 1967. p.28-38.

It is desirable to determine the nutritional value of single cell proteins when fed either as the sole source of the dietary protein or as a supplement to rice, wheat, corn, or other cereals, for human subjects. Studies in determining the nutritional value of various synthetic and natural protein sources have been conducted. Findings indicated that the nutritional value of the proteins in yeast is significantly higher than that of either wheat flour or wheat leaf and lower than that of casein. Specific aims of this investigation are: to determine the amino acid composition and other nutrient content of various species of yeast and bacteria which are used for producing proteins in substrates prepared from cellulose; to study the effect of substrates, processing procedures, and other environmental conditions on the amino acid composition and other nutrients content of single cell proteins; to study the availability of amino acids or other nutrients in single cell proteins; and to determine the nutritional value of single cell proteins when fed to human subjects.

FLY ASH UTILIZATION

67-1038
Barenberg, E. J. Lime-fly ash aggregate mixtures. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.111-134. (U.S. Bureau of Mines Information Circular No. 8348.)

This presentation summarizes findings from research on lime-fly ash aggregate mixtures. In certain instances, findings reported in the literature are supplemented by unpublished data. A brief summarization is also made concerning the influence of certain physical properties on the behavior and performance of pavements with lime-fly ash-aggregate materials.

67-1039
Barton, W. R. Fly ash as a portland cement raw material. Mining Engineering, 19(12):26, Dec. 1967.

A paper to be presented as part of a panel on 'Fly Ash—An Industrial Commodity' is summarized in the advance program for the Annual Meeting of the Society of Mining Engineers, to be held in New York City, February 25-29, 1968. The domestic portland cement industry consumes more than 12 million tons annually of raw materials chemically similar to fly ash. How these materials are used and how fly ash can serve in their place are discussed. Factors favoring whether a particular plant will use fly ash instead of an alternate material are described as negative factors which would disqualify fly ash as a raw batch component at some sites.

67-1040

Barton, W. R. Raw materials for manufacture of cement. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.46-51. (U.S. Bureau of Mines Information Circular No. 8348.)

The domestic portland cement industry consumes more than 12 million tons annually of raw materials chemically similar to fly ash. How these materials are used and how fly ash can serve in their place are discussed. Factors favoring whether a particular plant will use fly ash in place of an alternate material are described and so are negative factors which would disqualify fly ash as a raw batch component at some sites.

67-1041

Belot, J. R. Fly ash in concrete and concrete block. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.101-106. (U.S. Bureau of Mines Information Circular No. 8348.)

Producers of ready-mix concrete and concrete blocks use fly ash because it is profitable, increases workability, decreases shrinkage, and produces a high-quality material. Users of fly ash must be certain, however, that it meets specifications and uniformity standards by means of a regular testing program. Increased acceptance of fly ash in concrete products will depend upon educational and promotional programs carried out through the concrete product manufacturers and their trade associations in cooperation with coal producers and electric power producers.

67-1042

Bender, R. J. Fly ash can be a valuable asset. Power, 3(11):93, Nov. 1967.

Information on the treatment of fly ash from pulverized coal-fired power plants has been obtained during 4 years of operating experience at The Waylite Company in Michigan. Some of the problems involved and their solutions are outlined. In order to obtain pellets strong enough for sintering, and with a satisfactory combustible content, the fly ash used must contain at least 5 percent carbon and must be extremely fine. When fly ash with the desired carbon level is not available at the home plant, it is necessary to add some with high carbon content obtained from other plants. However, high carbon fly ash may be extremely coarse as well as quite variable in carbon content (14-60%). When coarse, a binder (e.g. clay slurry) must be added to form the pellets prior to sintering. Since the fly ash contains almost all the water needed for forming, the clay slurry must be kept as thick as possible to avoid excessive moisture. The sequence of operation is shown on a diagram. The current daily output of the Waylite plant is 600 to 700 tons. The procurement of adjacent land was suggested to support an end-product stockpile for several month. Space must also be provided for storing of unprocessed fly ash and for sintering waste. A secure year-around demand for the bulk of the product is needed at a price of at least $5.50 per ton to assure the economic viability of the recovery project.

67-1043

Bergemann, G. O. Use of fly ash in specialized concrete work. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.235-249. (U.S. Bureau of Mines Information Circular No. 8348.)

This paper is intended to give a brief history of the Prepakt process application for 'preplaced aggregate concrete' and how fly ash contributes appreciably to its strength, workability, impermeability, and economy. Illustrations and descriptions are also discussed to demonstrate how fly ash is employed in preplaced aggregate concrete to aid its qualities of drying shrinkage, resistance to weathering, and moduli of rupture and elasticity.

67-1044

Brackett, C. E. Availability, quality, and present utilization of fly ash. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.16-36. (U.S. Bureau of Mines Information Circular No. 8348.)

Basic data on current availability, quality, and use of fly ash are presented. Problems facing the industry are reviewed and suggestions are made for practical methods which can be used to solve some of these problems. Basic research data on fly ash is needed so that a quality product can be produced and sold at all times and under all conditions.

67-1045

Capp, J. P., and C. F. Engle. Fly ash in agriculture. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.210-220. (U.S. Bureau of Mines Information Circular No. 8348.)

Sintered and raw (unsintered) fly ash in various proportions up to 75 percent was mixed with soils in greenhouse and field tests to evaluate the powerplant waste as an acid soil neutralizer, soil conditioner, and source of trace plant nutrients. In the greenhouse tests, the total dry weight of the first harvest of some plants was greater than that of control plants, with a progressive increase in harvest weight accompanying an increase in percentage of sintered fly ash in the mixture. Toxicity effects of raw fly ash were largely eliminated by adding a high proportion of organic matter (peat). In the field-scale tests, the addition of raw fly ash having a relatively high pH successfully neutralized highly acid surface-mine spoils. Kentucky 31 fescue was planted on the neutralized spoils and established a luxuriant turf in a short time.

67-1046

Cuffe, S. T., and R. W. Gerstle. Emissions from coal-fired power plants; a comprehensive summary. Public Health Service Publication No. 999-AP-35. Cincinnati, U.S. Department of Health, Education, and Welfare, 1967. 26 p.

The Public Health Service and the Bureau of Mines conducted a study of air pollutant emissions from the six main types of coal-burning power plants. The components tested include sulfur oxides, nitrogen oxides, polynuclear hydrocarbons, total gaseous hydrocarbons, solid particulates, formaldehyde, organic acids, arsenic, trace metals, and carbon monoxide. This report relates the effects of variables such as method of operation, type of boiler furnace and auxiliaries, reinjection of fly ash, and type of coal burned to the concentrations of gaseous and particulate pollutants in the products of combustion.

67-1047

Dedman, H. W. Commercial utilization of pulverized fuel ash from power stations of the central electricity generating board. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.156-164. (U.S. Bureau of Mines Information Circular No. 8348.)

Fly ash has developed into a valuable by-product of the electric generating industry through intensive research, application, and marketing programs leading to its widespread use as a building and construction material. In Britain, fly ash-clay bricks, lightweight aggregates, concrete products, and road construction uses absorb over 40 percent of the total output. The degree of progress so far achieved is attributed to the organization of a system of marketing and timely, convincing publicity.

67-1048

Dust and ashes for bricks. New Scientist, 34(549):650, June 15, 1967.

A scheme for making bricks entirely from ash residues is discussed. The process was developed by the U.S. Office of Coal Research and the University of West Virginia. Proportions of fly ash and coarser 'bottom-ash' are moulded with water and sodium silicate. Procedure and temperatures for drying and firing are described. The resulting bricks are lighter and stronger than ordinary ones.

67-1049

Engle, C. P., and J. P. Copp. Flyash: new hope for strip spoil? Science Serves Your Farm and Home, Bulletin 544: 1-4, Winter 1967.

Due to its high pH value, high content of macro and micro plant nutrients, good moisture retention, and loosening effect when mixed with heavy textured soils, fly ash has been found useful as a soil additive and conditioner for reclaiming acid surface mined areas. During June and July, 1965, the Agronomy and Genetics Department of West Virginia University, in cooperation with the U.S. Bureau of Mines, Morgantown, tested the effect of adding fly ash to vegetation on a spoil area which had an initial pH value of 4. Growth of fescue, a perennial grass which provides good cover where the pH is above 4, was better on Test Plot 2 which received 600 tons per acre of fly ash mixed to 12 in. with spoil than on Control Plot 1-B which received 8 tons per acre of pulverized limestone. This was due mainly to a faster neutralization of spoil acidity. The pH value of the fly ash-treated plots was raised from initial value of 3.5 to 5.0 to 5.3. The fescue survived the first winter and developed an excellent root system, with continuing good growth into the spring.

67-1050

Erythropel, H. Ash production and utilization in the German Federal Republic. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.165-175. (U.S. Bureau of Mines Information Circular No. 8348.)

In the Federal Republic of Germany the utilization of brown coal ash is practically impossible, so that these have to be dumped as before. The production of hard coal ash is about 5.8 million tons. This quantity will probably not rise very much during the next few years because the consumption of high-ash coals is declining at present. Of these ashes, about 63 percent is utilized. This percentage, however, will continue to rise, owing to the promotion and instruction organized by private enterprise, and it should be understood that the processes yielding a cheap intermediate product at low capital outlay will be favored.

67-1051

Face brick from flyash. Rock Products, 70(10):96, Oct. 1967.

A pilot plant in Morgantown, West Virginia, operated under a project sponsored by the Coal Research Bureau (CRB) and financed by the Office of Coal Research, U.S. Department of Interior, produces high quality face brick from fly ash. The brick consists of 75 percent fly ash and a residual content of coarse aggregate such as bottom ash produced at the same time as the fly ash. The fly ash and the bottom ash are thoroughly blended with a small, accurate amount of sodium silicate, and the mixture is compacted into bricks which are then baked. The closed loop pneumatic conveying system employed in the plant includes a 50-ton fly ash hopper, a cyclone air filter, and a bag filter. The fly ash bricks, having an extremely smooth surface, are available in standard reds, buffs, and whites. A small plant (cost $1 million) producing 3,000 bricks per hr would pay for itself in 2 years; a larger plant (cost $2.2 million) producing 9,000 bricks per hr would pay for itself in 1.2 years. The estimated 1965 U.S. output of 20 million tons of fly ash per year will double by 1980. In 1965, 90 percent of the fly ash was dumped at a cost of $2 per ton. The sale of fly ash for brickmaking by the CRB process would yield a dividend of $0.25 per ton of coal burned.

67-1052

Falecki, Z. The United Nations Economic Commission for Europe and its work in the field of the utilization of ash produced by thermal power plants. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.135-142. (U.S. Bureau of Mines Information Circular No. 8348.)

This paper describes the United Nations Economic Commission for Europe (ECE) and its role in improving economic conditions in Europe and the world. The information exchange media of the Commission are described, along with its cooperative efforts. Highlighted is an account of the work of the ECE on fly ash utilization, including a list of major documents pertaining to activities in ash utilization published by the Secretariat.

67-1053

Fifty-four utilities give data on fly-ash sales and uses. Electrical World, 168(8):61-63, Aug. 21, 1967.

Data obtained from a questionnaire sent to the various utility companies indicate that more than half of the ashes produced in electric power stations today find no market or beneficial use. A chart is given which shows that fly ash production follows the coal consumed and covers the years from 1950 through 1966 with a projection given through 1970. A table is given, presenting the figures obtained in the survey of 54 utilities in the United States which burn 137.6 million tons of coal a year. The table gives the amount of coal consumed by each utility and the total consumed along with information on the ash divided into electrostatic and mechanical precipitator, fly ash, and bottom ash. The ash information covers the amount produced, the tons of ash sold, the end uses, the revenue, the tons used by the utilities, the uses by the utilities, the tons disposed of as waste and the cost of disposal. The utilities involved in the survey consume from 33,100 to 26,683,206 tons of coal a year with an average of 2.5 million tons per year. Of the 16 million tons of ash collected, 11 percent was sold and one-third was used by the utilities themselves. Fifty-six percent was just dumped. The predominant uses of ash include: additive to concrete, as landfill, and building block and road cinder. Other uses include lightweight aggregate, cement, bricks, soil stabilization, soil conditioner, and asphalt filler. More effort to develop the technology of fly and bottom ash usage and wider promotion of existing and new uses is required.

67-1054

Hester, J. A. Fly ash in roadway construction. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.87-100. (U.S. Bureau of Mines Information Circular No. 8348.)

Fly ash is presently used in three types of Alabama highway construction: base course stabilization, concrete bridges, and concrete pavement. The lime-fly ash stabilization projects are experimental, but the Alabama Highway Department has established specifications for fly ash used in concrete construction, and this material is now widely used in the State. Superior workability, flexural strength, and resistance to sulfate attack are claimed for fly ash concrete.

67-1055

Hoy, L. W. Consumer economics: use of fly ash in concrete. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.204-209. (U.S. Bureau of Mines Information Circular No. 8348.)

New and more economical methods of production, fabrication, installation, and erection are a necessary development to maintain a competitive position in our industrialized world. Material prices and wages are increasing constantly, making it mandatory that industry produce a better product more quickly and more economically. The reduction of costs, no matter how closely related the area may be to the final product, is constantly being scrutinized in every possible respect so that the ultimate realization of lower total costs may be effected. The use of concrete in the production of steel is not a direct cost, but, where concrete is increasingly being used, the reduction of installation and maintenance costs results in a substantial reduction in the production cost for a ton of steel. Increased technological advances in concrete increase the scope of concrete uses and ultimately will decrease the final product costs.

67-1056

Hyland, E. J. Fly ash in ready-mix concrete. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.80-86. (U.S. Bureau of Mines Information Circular No. 8348.)

Use of fly ash in ready-mix concrete offers a long-term solution to the fly ash disposal problem because large quantities can be absorbed by this potential market. To tap this market, however, producers must consistently supply a high-quality, uniform fly ash. The fly ash broker or sales engineer, to be truly effective, should know the type of customer he is dealing with and have a mastery of the technical aspects of fly ash-concrete mixes. Of equal importance is the giving of extra service such as aggregate analysis or concrete-mix design. National acceptance of concrete containing fly ash can be brought about through widespread advertising, participation in trade conventions, and the combined efforts of all interested parties.

67-1057

Jarrige, A. An attempt to explain French success in the utilization of fly ash. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.143-155. (U.S. Bureau of Mines Information Circular No. 8348.)

There are two types of utilization of fly ash, commercial cements and roadbuilding operations. During 1965, both these utilizations reached a level in France not observed in other countries. These results are attributable to special circumstances and to certain human initiatives, which differ for each of the two groups, but also to an overall situation with regard to the coordination of work, particularly with respect to technical research.

67-1058

Lebda, E., and E. Olszewski. Fly-ash replacing cement. Ochrona Povietrza, 1(3):15-19, 1967.

The beneficial influence of fly ash on the durability of concrete usually becomes evident only after 3 to 6 months of concrete hardening. The effect of such treatment after 28 days, which is of greatest interest to the user, has not yet been studied. In addition to a survey of various construction materials utilizing fly ash and of their present day applications, studies which specify the ratio of cement or sand and fly ash entering the composition of concrete are reported. It was shown that 10 percent of the cement added to the most frequently used concretes can be saved through replacement by fly ash. As to the amount of sand, best durability results were obtained for the mixtures with the least sand content, i.e. 35 percent. Fly ash and concrete mixtures prove especially satisfying after a longer period of hardening (exceeding 90 days). A large-scale industrial application of the new findings is also described and the results obtained are evaluated. (Text-Polish)

67-1059

McCoy, W. B., and D. K. Smith. Utilization of fly ash in the cementing of wells. Mining Engineering, 19(12):26, Dec. 1967.

A paper to be presented as part of a panel on ‘Fly Ash—An Industrial Commodity’ is summarized in the advance program for the Annual Meeting of the Society of Mining Engineers, to be held in New York City, February 25-29, 1968. Fly ash as an additive for oil well cement was introduced to the oil industry by the Halliburton Company in 1949. Since its early usage in Illinois, the total amount of fly ash pumped into wells has exceeded 30 million sacks. The advantages of using fly ash-portland cement mixtures in wells are fundamentally the same as they are for concrete, except conditions of placement and curing are variable and the nomenclature of properties are expressed somewhat differently. In some instances deep wells have been cemented with mixtures of fly ash and hydrated lime, together with an activator which functions as a catalyst for setting. This fly ash-lime formula has many advantages for high temperature-pressure conditions found in wells.

67-1060
Mielenz, R. C. ASTM specifications on fly ash for use in concrete. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.271-286. (U.S. Bureau of Mines Information Circular No. 8348.)

Committee C-1 on Cement and Committee C-9 on Concrete and Concrete Aggregates of the American Society for Testing and Materials have prepared two tentative standards that cover specifications and methods of test for fly ash as an admixture for portland cement concrete (ASTM Designations: C 350 and C 311, respectively) and a tentative standard on portland-pozzolan cement in which fly ash may be used as the pozzolan. Issued in 1953-1954, these standards have been modified as new data and information became available. The specifications provide a sound basis for purchase of fly ash for use in cement and concrete for construction purposes.

67-1061
Minnick, L. J. Reactions of hydrated lime with pulverized coal fly ash. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.287-315. (U.S. Bureau of Mines Information Circular No. 8348.)

Lime-fly ash specimens were cured at constant temperature and subjected to X-ray diffractometry, differential thermal analysis, pozzolanic reactivity tests, and microscopical investigations. Bars of lime-fly ash were subjected to cycles of wetting and drying, and measurements of length change were recorded. A discussion of variations within and among types of lime is presented. The nature of the pozzolanic reaction is reviewed, particularly as related to compounds which are used up and formed during the aging process. The relationship between the pozzolanic reaction and the resultant physical properties of the mixtures is examined.

67-1062
Moehle, F. W. Fly ash aids in sludge disposal. Environmental Science & Technology, 1(5):374-379, May 1967.

Fly ash used as a filtering aid in dewatering industrial waste plant sludge solves two disposal problems at once. The filtration plant described is designed to handle contaminated industrial waste by chemical means. The treatment is explained with the aid of a diagram. Dewatering begins when the ash and sludge mixture enters the filter. This operation is aided by a vacuum pump. Several aspects considered in the operation of the plant are: the proper concentrations of fly ash, the effect of sludge temperature, the effect of the pH of the sludge, the effect of the concentrations of the sludge solids, and the effect of various vacuum conditions. Each of these concerns is discussed in detail. Some mechanical problems involved with the use of fly ash are described.

67-1063
Once coal to ashes--now ashes to coal. Coal, Gold, and Base Minerals of Southern Africa, 15(3):25, 27, 29, 31, May 1967.

The Blinkpan Colliery plans to stabilize old workings with ash from the adjacent Komati power station. A 12-in.-diameter borehole has been completed to facilitate filling with a slurry consisting of 40 percent solids. The filling process is described in two steps; ash filling during the first shift, flushing of the pipe system and excess water pumped out in the second shift. Ash will be pumped alternately to Blinkpan and nearby Koornfontein Colliery. The major subject of the article is the construction of the seams and the extraction of the coal.

67-1064
Pacific island plans face-lift with fly ash. Electrical World, 168(11):23, Sept. 11, 1967.

Fly ash from Australia's coal-fired generating stations is being considered to rebuild the phosphate-rich island of Naurau which is being stripped away at the rate of 2 million tons a year leaving chasms and ravines, shown in illustration, as over one third of the island. The phosphate mining has stripped the island down to the coral rock so that it now looks like a section of the moon rather than a tropical paradise. The island, which is 2,200 miles northeast of Sydney, has a total area of 5,260 acres. It is estimated that in 30 years when the phosphate is gone, the 3,000 inhabitants will only have 1,000 acres left. Naurau which achieves independence Jan. 31, 1968, will take control of the $400-million phosphate industry. The island will get a net profit of $12 million a year until the phosphate is exhausted (in 25-30 years). The power stations in New South Wales have available 2.5 million tons of fly ash that could be sold to millionaires on Naurau to prevent property from being sluiced away. A foot of top soil on the ash would give it the same crop potential as ordinary earth. An inch of top soil would greatly increase the range of crops and ~~vegetation~~ while the pure ash with the addition of fertilizers can support clover and certain grasses and vegetables. The fly ash could be transferred pneumatically to and from the ships and then sluiced in a water suspension into abandoned phosphate works. Fortunately, the Naurau millionaires have the money to transport the fly ash to preserve their island.

67-1065

Paprocki, A. Production and utilization of fly ash in Poland. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.176-186. (U.S. Bureau of Mines Information Circular No. 8348.)

Although production and utilization of fly ash in Poland are increasing yearly, the latter lags behind the former and by 1975 almost 5 million tons will have to be discarded. Comparative reactivity tests between fly ash and several types of aggregates show that fly ash has binding properties and should not be treated as an aggregate. A test procedure is described to evaluate the degree of pozzolanic reactivity of fly ash.

67-1066

Pearson, A. S. Experience in production and utilization of lightweight aggregate at Consolidated Edison. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.190-194. (U.S. Bureau of Mines Information Circular No. 8348.)

Consolidated Edison in 1966 collected 350,000 tons of fly ash and sold 60,000 tons (17.2 %) for commercial purposes. Disposal of the difference costs more than $550,000, not including capital investment, and operating costs for equipment. Several years of experience in building and operating a lightweight aggregate plant are described, including boiler changes for aggregate quality control. Principal commercial applications for sintered fly ash are discussed, along with marketing experience and promotion activities.

67-1067

Philleo, R. E. Fly ash in mass concrete. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.69-79. (U.S. Bureau of Mines Information Circular No. 8348.)

Fly ash is used in mass concrete for two principal reasons: economy, and reduction of heat generation within the concrete. The Bureau of Reclamation and Corps of Engineers specify a low-carbon fly ash and use it as a straight replacement for a portion of the portland cement. Ontario-Hydro uses ash from its peaking powerplants and, therefore, has developed a technique for using high-carbon ash. TVA has used coarse ash from mechanical collectors, partially as cement replacement and partially as aggregate replacement. European practice is to use portland-pozzolan cement. Research indicates that the proportion of fly ash in interior mass concrete may be increased.

67-1068

Pursel, H. R. Fly ash handling in coal fired steam generating plants. Combustion, 37(7):22-25, Jan. 1967.

Fly ash, accumulating in the rear pass, the economizer air heater, and the fly ash collector of coal fired steam boiler hoppers must be removed to storage or for further handling. The fly ash handling systems now in use are reviewed. The details of the arrangements of various fly ash handling systems and their operation are described. The arrangements are discussed with a series of line drawings to illustrate the various phases. Seven arrangements are shown, both individually, and then in one sketch which shows them side by side so that the differences and common points may be compared. When there is a fill or lagoon area available, the simplest method of disposal provides for the pneumatic conveying of the fly ash to the water-operated multi-jet venturi type exhauster where the fly ash is mixed with the water from the jets. After impingement on a separator plate, the air is vented to the atmosphere and the fly ash suspension flows by gravity to the fill area or lagoon. A sump pump is provided in another arrangement for a fill area at any location. Other arrangements shown include: one with fly ash storage bins, collectors and conditioners; one with water scrubbers; and one with cloth filters. All of these devices are equipped with mechanical air exhaust equipment. Two other types are shown in which the exhaust is operated by water and steam. The water type discharges the fly ash to a silo while the steam type discharges to a water scrubber.

67-1069

Pursglove, J. Fly ash in 1980. Coal Age, 72(8):84-85, Aug. 1967.

The question is raised as to the disposition of the 45 million tons of fly ash which will be produced by the U.S. electrical utility industry per year by 1980. At the present, only 6 percent is being utilized as cement replacement in concrete and concrete products, as an ingredient in lightweight aggregates, as an ingredient in asphalt paving, and as a constituent of soil stabilizers. The remaining fly ash is dumped at a cost of $2 a ton and creates a nuisance also. A projected flow sheet is given to indicate the uses of fly ash in 1980 with 24 million tons going into building products such as bricks, blocks, and aggregates. By subjecting the fly ash to crushing, pulverizing, magnetic separation, air separation, heavy-media separation, and sophisticated forms of froth flotation, fly ash could be made a raw material for a number of valuable metals which are shown on the chart with the amounts available. For example, the portion rich in alumina could produce 5 million tons of aluminum (U.S. production in 1966 was 3 million tons). The 9 million tons of iron oxides shown on the flow sheet could produce 8 million tons of high-grade iron ore pellets. In addition to being the source of 24 million tons of silica and lime for bricks, blocks and aggregates, and unknown amounts of uranium, germanium, and vanadium, the flow sheet indicates that by 1980 technology will have progressed sufficiently to allow the recovery of 500,000 tons each of titanium dioxide, potassium oxide, sodium oxide, and phosphorus pentoxide.

67-1070

Remirez, R. Fly-ash debut in brick manufacturing. Chemical Engineering, 74(1):124-126, May 8, 1967.

A Morgantown, West Virginia, plant will make bricks entirely from fly ash, unburned material left after combustion of coal, utilizing 74 percent fine ash, 23 percent coarse bottom-ash, and 3 percent sodium silicate binder. The fly ash brick is stronger than clay-based bricks, yet 30 percent lighter. Bricks form at low pressures from a high-viscosity mix. The fly ash, slag, sodium silicate, and water mixture is conveyed to a 750-ton hydraulic toggle-press. Cored bricks, formed at the rate of 32 to 40 per minute, are fired in two gas-operated kilns, each having 500-brick capacity. Bituminous coal fly ash bricks are heated at 250 F for 2 hr to eliminate moisture. Further heating, at a rate of 175 F per hr, follows until the temperature reaches 2,000 F. The changes during firing are physical, not chemical. The sodium silicate binder becomes a viscous liquid and fly ash mineral components undergo vitrification. The plant would cost $635,000 for a 500,000 bricks-per-week plant, using a periodic kiln, or $1.1 million using a tunnel kiln. Present production costs are $22 per 1,000 bricks. The plant diagram is depicted.

67-1071

Seabright, J. Fly ash in concrete manufacturing. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.107-110. (U.S. Bureau of Mines Information Circular No. 8348.)

A quality concrete producer who can keep his variation in quality at a minimum is able to market concrete on a strength basis. With fly ash, he can improve the quality of his concrete as far as workability and finishability are concerned, while effecting sizeable cost reductions by eliminating portland cement provided he has the necessary communication and field control so as to make adjustments to the added variables brought about with the use of fly ash. The greatest advantage of fly ash concrete, namely, its retardation effect, is also its greatest limitation. Research should be done to determine the ill effects, if any, that result from use of accelerators, which must be used in order to market fly ash concrete on an overall year-round basis.

67-1072

Shafer, H. E., C. F. Cockrell, and J. W. Leonard. Appraising and improving fly ash for use in fired structural building products. Mining Engineering, 19(12):26, Dec. 1967.

A paper to be presented as part of a panel on 'Fly Ash—An Industrial Commodity' is summarized in the advance program for the Annual Meeting of the Society of Mining Engineers, to be held in New York City, February 25-29, 1968. The quality of fly ash to be used in structural materials can be predicted by determining the amount of detrimental scum and efflorescence-forming water-soluble mineral matter present in the fly ash. Low quality fly ashes that are high in water soluble minerals may be utilized by the addition of small amounts of low-cost acid. A comparison between fly ash brick made from low quality, high water soluble, mineral content fly ash, with and without the addition of an acid, shows that the use of an acid additive increases the green and fired strength, retards scumming and fired efflorescence, and enhances general physical appearance.

67-1073

Shafer, H. E., C. F. Cockrell, K. K. Humphreys, et. al. Status report on bricks from fly ash. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.195-203. (U.S. Bureau of Mines Information Circular No. 8348.)

Optimization of the West Virginia University-U.S. Department of the Interior, Office of Coal Research fly ash-based brick process for each fly ash-aggregate combination can produce even higher quality brick than those reported previously. Originally, estimated production costs for a fly ash from one source were $30.52 per 1,000 bricks, assuming a value of $1 per ton for fly ash; however, optimization tests together with the use of actual rather than estimated equipment cost has shown that the cost of producing brick from this same fly ash can be reduced to $22.22 per 1,000 brick. A pilot plant for producing fly ash-based structural materials is now under construction and should be in operation by late spring of 1967. The plant is so designed that it will be capable of producing tonnage lots of fly ash brick, hollow block, and paving tile. In keeping with the objectives of the pilot plant program, broad-scale and conclusive cost and optimization studies as well as marketing surveys are underway.

67-1074

Skaggs, H. C., and R. E. Morrison. Producing specification fly ash. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.52-57. (U.S. Bureau of Mines Information Circular No. 8348.)

Described in this paper is the experience of the Appalachian Power Company in producing specification fly ash at its Kanawha River Plant. Boiler adjustments, coal-fineness control, ash sampling, and other factors are discussed. Details are also given on a fly ash processing plant for producing a specification product.

67-1075

Smith, D. K. Utilization of fly ash in the cementing of wells. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.221-234. (U.S. Bureau of Mines Information Circular No. 8348.)

Fly ash as an additive for oil well cement was introduced to the oil industry by the Halliburton Company in 1949. Since its early usage in Illinois, the total amount of fly ash pumped into wells has exceeded 30 million sacks. The advantages of using fly ash-portland cement mixtures in wells are fundamentally the same as for concrete except that the conditions of placement and curing are variable and the nomenclature of properties are expressed somewhat differently. In some instances deep wells have been cemented with mixtures of fly ash and hydrated lime together with an activator which functions as a catalyst for setting. This fly ash-lime formula has many advantages for high temperature-pressure conditions found in wells. (This article also appears in Mining Engineering, 19(12):26, December 1967)

67-1076

Smith, I. A. The design of fly-ash concretes. Institution of Civil Engineers Proceedings, 36(1966-1967):769-790, Apr. 1967.

A method for use in the design of concrete mixes to give a required early strength and degree of workability when incorporating fly ash is described. The strength of the resulting mix depends on the relative proportions of ash, cement, and water. The usefulness of the method is shown by comparison with a large number of tests on fly ash cement concretes and with analysis of previously published papers from external sources. Also mentioned is the lowered cost. It is shown that there is no need to accept a loss of early strength when using fly ash in concrete.

67-1077

Snyder, J. M. Specifications, limitations, and restrictions. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.37-45. (U.S. Bureau of Mines Information Circular No. 8348.)

In most cases, the selection of characteristics of fly ash to be specified and the specified limits on these characteristics have been based on empirical correlations between the characteristics of a wide variety of fly ash samples and the resultant properties of products made from these samples. Differences in specifications by various groups are given, along with detailed specifications on fly ash for use in concrete. Limitations and restrictions include lack of knowledge on specifications and testing methods, variability of fly ash, existence of broad patents, and marketing factors. A pessimistic outlook for fly ash marketing is presented, but progress is indicated as promising. The work now going on will likely lead to more realistic specifications and confidence in fly ash use.

67-1078

Snyder, J. M. Specification, limitations and restrictions on the utilization of fly ash. Mining Engineering, 19(12):26, Dec. 1967.

A paper to be presented as part of a panel on 'Fly Ash—An Industrial Commodity' is summarized in the advance program for the Annual Meeting of the Society of Mining Engineers, to be held in New York City, February 25-29, 1968. In most cases, the selection of characteristics of fly ash to be specified and the specified limits on these characteristics have been based on empirical correlations between the characteristics of a wide variety of fly ash samples and the resultant properties of products made from these samples. Differences in specifications by various groups are given, along with detailed specifications on fly ash for use in concrete. Limitations and restrictions include lack of knowledge on specifications and testing methods, variability of fly ash, existence of broad patents, and marketing factors. The results of recent research on the characterization of fly ash and on its pozzolanic properties are discussed in terms of relevance to present specifications and prospects for developing more realistic specifications.

67-1079

Start pilot plant for making fly ash brick. American Ceramic Society Bulletin, 46(8):740, Aug. 1967.

The 20,000,000 tons of fly ash produced in 1965 is expected to double by 1980; only 10 percent is now utilized in asphaltic concrete, building blocks, soil stabilizers, cement, and lightweight aggregate while the rest was dumped at a cost of $2 a ton. The economic and technical feasibility of utilizing this waste product is being investigated at a pilot plant for making face brick in Morgantown, West Virginia. The operation, financed by the Office of Coal Research, United States Department of the Interior, is being carried out by the Coal Research Bureau at West Virginia University. At this plant prototype bricks have been made from 74 percent fly ash, 23 percent of a coarser aggregate (such as the bottom ash from the same plant) and 3 percent sodium silicate by pressing these materials, which have a moisture content of 9 percent. Extrusion was possible only with large amounts of plasticizers. A photograph of a 50-cu in. clay brick on a balance with a 65-cu in. fly ash brick shows that it takes an additional 500-g weight on the fly ash brick to balance the scales, which demonstrates the lighter weight advantages claimed for the fly ash brick. Brick plants near the sources of fly ash could use their present tunnel kilns together with much of their other equipment, if they converted to fly ash as a raw material.

67-1080

Stewart, R. F., and W. F. Farrior. Nuclear measurement of carbon in fly ash. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.262-270. (U.S. Bureau of Mines Information Circular No. 8348.)

A nuclear method for the continuous measurement of carbon in fly ash was demonstrated as technically feasible. The number of carbon gamma rays from inelastic scatter of neutrons is proportional to the carbon content of 12- and 20-pound samples. Carbon in fly ashes containing 2 to 16 percent carbon was determined within 0.5 percent carbon, and repeated tests measuring the carbon content of iron ore sinter mix showed a precision of 0.2 percent. The accuracy may be adequate for process control, and the technique shows promise of being adaptable to carbon monitoring of any granular material moving at high-tonnage flow rates.

67-1081

Stolnikov, V. V. Fly ash in cements and concretes. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.187-189. (U.S. Bureau of Mines Information Circular No. 8348.)

A short discussion is presented on the investigation of fly ash utilization in the Concrete Laboratory, Hydrotechnics Research Institute, Leningrad. The properties of fly ash cement and concrete are described, including specific surface area, water requirements, and the effect of steam curing, particularly on the strength of the product.

67-1082

Turning fly ash from onus to bonus. Chemical Engineering, 74(10):98-102, May 8, 1967.

Potential uses of fly ash are discussed from the standpoint of turning an unwanted waste into an asset. Although fly ash increases the strength of concrete, decreases the vulnerability to freezing, helps to give sharp corners to concrete blocks, and makes strong light bricks, there is a lack of acceptance. This lack of interest results from lack of knowledge of the product, insufficient promotion, inadequate specifications, inadequate testing methods, and a lack of standard quality. Carbon in fly ash from poor combustion and inadequate pulverizing has a poor effect on the setting and strength of fly ash concrete. One long term use of fly ash is in the cementing of oil wells. Proposed uses include fly-ash applications in agriculture as an acid-soil neutralizer, as a soil conditioner, as a raw material for cement manufacture, and for use in road construction.

67-1083

Zimmer, F. V. Problems in fly ash marketing. In Proceedings; Fly Ash Utilization; Edison Electric Institute, National Coal Association, and Bureau of Mines Symposium, Pittsburgh, Mar. 14-16, 1967. Washington, U.S. Government Printing Office, 1967. p.58-68. (U.S. Bureau of Mines Information Circular No. 8348.)

A short history of pulverized fuel presents factors that guide the activity of marketing the resulting ash. A brief description of some of the major fly ash markets is included, to point out problems associated with these markets.

SANITARY LANDFILL

67-1084

Airstrip and playfield built atop former Scottish site. Refuse Removal Journal, 10(12):34, Dec. 1967.

The method used in reclaiming an area of sandbanks and mud flats along the estuary of the Tay River at Dundee, Scotland, is described in a publication by W. A. Lewis called 'Controlled Tipping of Refuse'. A sea wall of heavy demolition material was carried upriver for about 400 yd and built to a height of 20 ft above the river bed, or 4 ft above high-water level. The area enclosed was then partitioned into lagoons, which were filled in with earth, clay, construction materials, clinker, etc. In 1950 the site came into use as a domestic refuse landfill. As the area extended, it was covered with 2 ft of soil and sown with grass. Permission has been obtained to extend the area of reclamation, but the rate of expansion is limited by the amount of hard-core material available for the 30-ft wide embankments used to structure the area and to protect the fill from strong river currents. Some 25,000 tons of refuse are accepted annually, adding 6 acres each year. Dundee officials have found that no crude refuse can be dumped into lagoons which still contain water, since the action of water on paper and cardboard yields hydrogen sulfide. This problem does not arise in winter. Playing fields and an airstrip have been built on the reclaimed land.

67-1085

Albertson, L. M. Revamped refuse dump draws praise. Public Works, 98(1):88-89, Jan. 1967.

An improved sanitary landfill operation in Southold, New York, is described. The improvements consisted of the addition of two fences, one permanent and one movable, and the use of a machine to move and cover the refuse. The movable fence funnels all deliveries to one part of the site. This gives the two men at the landfill the control necessary to insure that the refuse is properly separated and dumped where the operators want it, and that smoldering trash is extinguished. The permanent fence prevents paper from being blown out of the fill site, and it keeps out scavenging animals and children. A Hough Model H-90 C Payloader was selected for moving and covering the refuse. This tractor shovel has power shift and steering, travels at 21 mph in both directions, has a 4-yd bucket for handling refuse, can carry 9,000 lb, and is articulated in the center so that its wheels track precisely. It has been operating at the landfill for 2,200 hr with 3 to 4 hr per month downtime for service and repairs and 2 days for a punctured tire. The purchase of a spare tire has reduced downtime for a puncture to ½ day. Refuse delivered to the site--an old sand pit that covers about 8 acres and is 40 ft deep--is inspected for smoldering. The inspector also sorts out all wood. The refuse is then dumped at the edge of the pit or transported down the ramp to the floor of the pit and dumped. The payloader compacts the refuse and blankets it with about 2 ft of sand. The machine also stacks wood for burning and transports junked cars to a selected place at the side of the landfill site.

67-1086

Andersen, J. R., and J. N. Dornbush. Influence of sanitary landfill on groundwater quality. American Water Works Association Journal, 59(4):457-470, Apr. 1967.

A report is given of a study to afford a more generalized conclusion than is now possible, concerning the groundwater quality as affected by a sanitary landfill located in a gravel pit that penetrates a high water table. Twenty-two sampling points were installed at ten locations to study the general quality of the groundwater, the level of the table, and the direction of underground water movement, to determine whether the leaching of the refuse dump and a small pond in the immediate area of the fill affects the chemical quality of the groundwater. The parameters selected to describe the chemical quality were pH, specific conductance, total hardness, calcium hardness, alkalinity, chloride, nitrate, sodium, and potassium. Samples were taken every 3 to 4 weeks for a 6-month period, resulting in six samples from 22 wells plus two samples from the pond. Six wells were chosen as controls to indicate the chemical quality of the water entering the area. A geologic investigation of the site was also made. The quality of individual samples was compared with that of control wells, and change of water quality with time, location, and depth was determined. The results indicate that the groundwater leaving the 160-acre disposal site is not seriously impaired. However, groundwater in the immediate vicinity of a refuse landfill can exhibit a significant increase in the concentration of dissolved minerals as determined by specific conductance measurements. The algae-laden pond located immediately downstream, which receives groundwaters from the fill area, is an important factor in reducing the hardness and alkalinity of these waters during the summer.

67-1087

Barratt, J. H. Spoil tips and landscaping with some reference to planned refuse disposal. Public Health Inspector, 75(11):439-446, Aug. 1967.

Colliery wastes cover 2,225 acres of Nottinghamshire County, Great Britain. There are 111 spoil tips, of which 48 are unused. Layer tipping by dump truck has three advantages over older tipping methods: unsightly ropeways are not needed; mounds can be molded to more acceptable shapes; and driving the vehicles over the tip increases compaction and thus reduces the possibility of spontaneous combustion. Trial plots on unused dirt tips were sown with nine different types of grass seed to discover which types grew best on raw shale. The reliability of hydraulic grass seeding was tested. The County Planning Department is planting some trees to naturalize the tip in the landscape. Operating in narrow seams renders underground storage of wastes impractical. The material can be transferred by rail to fill in the brick clay excavations at Cambridgeshire and Bedfordshire. Grouping areas into regions for mutual refuse disposal is suggested. There will not be enough land for controlled tipping. A survey might ascertain what areas of land would benefit from land reclamation or raising.

67-1088

Bevan, R. E. Notes on the science and practice of the controlled tipping of refuse. London, The Institute of Public Cleansing, 1967. 216 p.

Experiments and conclusions by the Institute of Public Cleansing on controlled tipping are recorded. Controlled tipping is the disposal of refuse by tipping on suitable sites in accordance with rules and recommendations to ensure that it will be done without giving offense or endangering public health. Suitable sites may be low-lying land; undulating land to be levelled for use; valleys, cuttings or ravines to be filled; quarries; claypits; dangerous ponds; etc. Items which need attention before tipping begins are: working plans, site works program, permanent civil engineering works, and other permanent and temporary site works. The methods of controlled tipping are sometimes complicated and require expert knowledge and experience by a number of specialists, as well as diligent attention to the everyday management at the site. The main aspects of the management of a controlled tip are preparation for tipping, maintenance of the site, and finishing for use. Five experiments conducted in Manchester are: a comparison of methods used in the 1930's with those used in 1965; the excavation of a refuse tip after 25 years; the decomposition of refuse after tipping in paper sacks; the decomposition of refuse in paper sacks and refuse in polythene sacks, tipped in a small heap of loose refuse; and the effects of tipping low-density refuse having a high paper content. Aspects of control of tipping sites include: the estimation of tip capacities and quantity of covering material needed, the destruction of insects and rats, and the use of mechanical aids for tipping.

67-1089

Bevan, R. E. What is controlled tipping? In Notes on the science and practice of the controlled tipping of refuse. London, The Institute of Public Cleansing, 1967, p.6-7.

Controlled tipping is the disposal of refuse by tipping on suitable sites in accordance with rules and recommendations to ensure that it would be done without giving offense or endangering public health. The main rules are precautions advising the filling of holes by layers of refuse of a limited depth, the covering of layers by suitable material to form a seal, the provision of screens to prevent refuse being blown away, the avoidance of tipping into water, and measures designed to present a neat and tidy appearance at the tip. Controlled tipping is inexpensive and can be used as a means of land reclamation. Sites can be either near or far from the city. Alternatives to direct controlled tipping are: direct incineration; and separation coupled with incineration, composting, and controlled tipping.

67-1090

Bevan, R. E. The science of controlled tipping. In Notes on the science and practice of the controlled tipping of refuse. London, The Institute of Public Cleansing, 1967. p.8-29.

The refuse lying beneath the seal of a controlled tip is a heterogeneous mass comprised of two main classes of refuse--organic (about 42%), and inorganic (about 58%). Decomposition in organic refuse is the result of bacteria which can be divided into three main classifications: saprogenic, associated with decomposition; zymogenic, associated with fermentation; and pathogenic, associated with diseases of man. A rise in temperature in the body of a controlled tipping plot, below the seal, is an early indication that bacterial action has commenced. Any rise or fall in the temperature of the controlled tip is an indication of the length of time required for the earlier changes to take place and of the presence of much or little organic matter. It also has a bearing on the from the chance presence of pathogenic germs. In practically every case the reactions caused by bacterial activities on organic materials result in the formation of a gas. Items which effect biological and chemcial changes in organic refuse are: moisture, ammonia and other nitrogenous products, humus and humic acid, and rusting of iron articles. There is a risk of fire through the tipping of hot ashes or clinkers. Pathogenic germs may be present in a controlled tip.

67-1091

Bevan, R. E. Ministry of Health--suggested precautions. In Notes on the science and practice of the controlled tipping of refuse. London, The Institute of Public Cleansing, 1967. p.30-33.

The precautions which are discussed in detail, consist of the following: tipping in layers; depth of layer; covering of layer; covering in 24 hr; screens; tipping in water; possibilities of fire; prevention of flies, crickets, and rats; precautions regarding organic waste; loose tins lying near the surface of the tip; personnel; settlement of the refuse; raising the tip above surrounding land; quick tipping of refuse; and protecting refuse during transit. These precautions were published in a Ministry of Health Annual Report. There may be some refinements in practice which improve the control, but if properly interpreted the broad principles suggested are as applicable and as successful today as they were when first devised in 1965.

67-1092

Bevan, R. E. Selection of sites. In Notes on the science and practice of the controlled tipping of refuse. London, The Institute of Public Cleansing, 1967. p.34-46.

Suitable sites may be: low-lying land, marsh, foreshore, marginal, or moorland, to be raised and reclaimed; undulating land to be levelled for use; valleys, cuttings or ravines to be filled; quarries, claypits, gravel pits, holes, dangerous ponds, canals, and subsidence areas to be reclaimed. The points to be looked for in assessing a site are position and physical features, terms of use, and civil engineering works. Dereliction might be reduced somewhat if more were known about the distribution and industrial usefulness of workable deposits, and if more care were taken to co-ordinate the activities of the various agencies responsible for the digging of holes and the disposal of wastes. A study was done concerning a backlog of land officially defined as useless for the time being due mainly to industrial excavation. It was found that about 150,000 acres were lying derelict. Proper reclamation is only possible if the final use of the land is known before work begins and kept in mind as excavation and restoration take place. It is essential to know what the final levels should be and where drainage channels or footpaths are to be placed when the excavation is refilled. The types of minerals in a given area must be considered when deciding means of land restoration. Three types of minerals discussed are sand and gravel, brick clay, and limestone.

67-1093

Bevan, R. E. Preparing the site. In Notes on the science and practice of the controlled tipping of refuse. London, The Institute of Public Cleansing, 1967. p.47-53.

Before tipping begins, working plans should show the boundaries, existing levels, proposed finished contours, site of hutments, etc., restrictions or conditions noted under town planning approvals, drainage or culverting works, soil-storage areas, or any other features which may be useful to the supervisory staff in charge. The site works program timing will vary in accordance with the contract work needed, weather conditions, and planning approvals. It is usually best for all aspects of the site works to be carefully completed before becoming involved with the inflow of refuse. Permanent civil engineering works and other permanent site works must be completed. Temporary site works may be undertaken at the appropriate stage to include: access roads, hutments, weighbridges, fencing, trees and shrubs, soil stripping, boundary markers and reference points, staff, stores, machinery, and equipment. It is important to have a program when a number of disposal points are in use; otherwise drivers may tend to use the tip most convenient for them. A tip scheduled to last for a certain period will be filled in much less time if this program is not devised. The preliminary program should outline the aims on the site, select the areas to be soil-stripped first, select the areas to be tipped and finished first, and show the portion to be 'window-dressed'.

67-1094

Bevan, R. E. The general management of a controlled tip. In Notes on the science and practice of the controlled tipping of refuse. London, The Institute of Public Cleansing, 1967. p.54-71.

The general management of a controlled tip includes: preparation for tipping, maintenance of the site, and finishing for use. General rules are: try to maintain a regular staff, each individual knowing his duties; tip according to a preconceived plan; maintain the entrance area and buildings; consider problems such as fires, windy weather, wet weather, radioactive refuse, and manhole dangers. Management preparations for tipping include: soil stripping, making approach roads and tip roads, posting notices, erecting marker posts, checking weighbridges, salvaging, and considering possible problems of ponds on the site. Factors in maintaining the site include: keeping the area neat; erecting screens; cutting down weeds; maintaining tip roads; controlling for rats and insects; covering the new tip surface each day; keeping notices in good condition; maintaining marker posts, direction lamps, tools and equipment; checking rough levels and water pollution; and keeping unauthorized persons off the site. Some guiding principles for determining how long a tip should be allowed to settle are: the depth of tipping, initial settlement, final inertia, compaction, type of refuse, type of development, and trial holes. Completed fills are suitable for such uses as parks, playgrounds, golf courses, parking areas, landing fields, and light industrial or commercial buildings.

67-1095

Bevan, R. E. Recent experiments in Manchester. In Notes on the science and practice of the controlled tipping of refuse. London, The Institute of Public Cleansing, 1967. p.72-103.

Tipping methods in the 1930's were compared with those in the 1960's, and the effects of compression of refuse were observed. An analysis of refuse (shown in percentages of components by weight) was made, temperatures were recorded and compared among the plots, and the possibilities of spontaneous combustion were discussed. An extensive gas analysis was made in each plot in a number of positions. An excavation was made in each plot to assess densities, settlement, and compaction. The second experiment consisted of notes on an excavation of refuse 25 years after tipping in Northenden, Manchester. Some of the findings were: (1) Decomposition of bundles of papers occurred on the outside of the bundle only. (2) Articles such as textiles wrapped in bundles of paper were unaffected. (3) Leather articles were virtually intact. (4) There was no evidence of vegetable and putrescible material. (5) Metals were almost nonexistent. There did not appear to be much difference between refuse tipped in paper sacks and bulk-collected refuse in other experimental plots. Experiments were conducted to observe the decomposition of papersack refuse and refuse in polythene sacks, tipped in small heaps of loose refuse. The paper sacks decomposed completely within a year; the polythene sacks showed little decomposition. The last experiment was conducted to observe the tipping of low-density refuse having a high paper content.

67-1096

Bevan, R. E. Notes on specific aspects of control. In Notes on the science and practice of the controlled tipping of refuse. London, The Institute of Public Cleansing, 1967. p.104-131.

It is possible to estimate tip capacities by volume fairly accurately. This can be done when the types of refuse and the approximate amounts of each to be tipped are known. Quantity of covering material needed depends upon varying conditions of the tip but a few specific factors to be considered are: the method of treating the face, degree of surface compaction, rate of intake, depth of tipping, width of face, intervals between sealing the face, and the general tipping plan. Precautions must be taken to control insects, using insecticides. Rats must be destroyed by poisoning, fumigation, and trapping. Water pollution is a threat when tipping into water which has ponded, or when tipping on land near underground water sources. Recommendations include research projects concerning gas production qualities, observation of gas movement, control of gas movement, leaching studies, monitoring of field moisture, and prevention of percolation. Types of machines used at tipping sites include excavators, bulldozers, mechanical shovels, scrapers, dump vehicles, graders, and tractors. Conditions of the tip must be kept in mind when purchasing machines, for they vary in size, make, and power. Machine operators should be trained carefully in the proper use and maintenance of machines.

67-1097

Bevan, R. E. What of the future? In Notes on the science and practice of the controlled tipping of refuse. London, The Institute of Public Cleansing, 1967. p.132-138.

In order to look at future changes of controlled tipping it is necessary to examine factors which might affect this method of refuse disposal. Composition of refuse is a basic factor to be considered. Quantities and the nature of refuse are affected by the method of space heating and the packaging of goods. Another factor of refuse disposal is the organization of local government--how controlled-tipping is practiced. A third factor is any change in the organization of the public cleansing service. A new organization has been created in London called the Greater London Council which has separated the responsibilities of refuse collection from those of disposal. With cooperation and coordination between two services, controlled-tipping practices may be introduced on a much wider scale and with a more efficient and positive approach than has been possible in the past. Factors likely to influence a decision to change from or to controlled tipping are cost and standards. Developments in road and rail transport, with an emphasis on faster, freer movement, may call for a new look at bulk haulage of refuse. Investigations into the conservation of natural resources may affect refuse disposal generally and so affect the controlled-tipping method. Changes in town planning may bring new methods of refuse storage and collection. Suggestions for research are: water pollution control, building on tipped land, tipping needs, the use of refuse and compost for land reclamation, and the division of responsibility for refuse collection and disposal.

67-1098

Bowerman, F. R. Land reclamation. In L. Weaver, ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.87-92.

Sanitary landfill operations in Southern California are run like a private business. Each site has its own weigh-scale facilities, so charges are assessed directly on a tonnage basis. Los Angeles County has specially designed transfer-trailer rigs that allow landfill sites up to 50 miles distant from the transfer station to be used economically. The basic operation at Los Angeles landfills calls for dumping solid wastes at the base of an artificially created hill. Landfill procedure is described and equipment is discussed. Specific examples of successful operations are described. The finished operations have been used as sites for golf courses and parks. Landfill can also provide security against landslides in canyons. Tests to determine whether landfills contaminate ground water are outlined.

67-1099

California State Water Quality Control Board. In-situ investigation of movements of gases produced from decomposing refuse; final report. Publication No. 35. Sacramento, State of California, The Resources Agency, 1967. pts. I-IV.

A 4½-year study attempted to obtain answers regarding the extent of hazard to groundwater posed by the movement of refuse-produced gases, so that various agencies might better formulate rubbish disposal requirements pertaining to the protection of groundwater resources. Answers to the questions of how fast certain gases move in the soil have been found, and estimates have been made on how much gas can be expected per ton of refuse disposed. This estimate was based on actual gas movement data and an estimate of the so-called 'life' of the fill was made. Gas control devices and methods were developed should control be considered necessary in given cases. Results at various test sites, data on gas comparison studies, and other studies are offered. It is concluded that over 90 percent of the gas produced by refuse decomposition in large landfills is carbon dioxide and methane. Both of the gases have been found in concentrations up to 40 percent each at lateral distances up to 400 ft away from the edge of the fill. Methane poses less of a threat to groundwater because it is only slightly soluble in water and is lighter than air, tending to rise. By far the greater part of refuse-produced gas goes upward to the atmosphere, but movement into the ground can be expected for many decades.

67-1100

California State Water Quality Control Board. Results at various sites. In In-situ investigation of movements of gases produced from decomposing refuse; final report. Publication No. 35. Sacramento, State of California, The Resources Agency, 1967. pt. I (p.1-53).

Experimental installations for the gas movement study were located at four test sites in Los Angeles County; these were at Azusa, Calabasas, Palos Verdes, and a Special Study Refuse Fill. The locations of these test sites (except the Special Study) are shown. An additional study was carried out at the Brisbane landfill near San Francisco. A description of each test site and of the experimental installations at each site is given. The mean carbon dioxide and methane concentrations in the two refuse layers since the Azusa fill was made are tabulated. The Azusa test site yielded answers regarding the rate of carbon dioxide movement in the soil and afforded an opportunity to compare field measurements with answers obtained through theoretical considerations. Five measurements at four locations were made of the rate of carbon dioxide transfer to the atmosphere from the refuse fill at Azusa by means of a specially-designed surface monitoring apparatus, which is shown. The rates of transfer of gas into the air and into the ground are summarized. It is possible to conclude that effective barrier-type gas control membranes, installed, can be purchased for 10 percent or less of the sum of land costs and operational costs for sanitary landfilling. The asphalt technique as described is probably only one of several membrane-barrier techniques that would be successful. A gas barrier installed before landfilling will also act as a leachate barrier, and some form of leachate pumping or removal system must be provided.

67-1101

California State Water Quality Control Board. Gas comparison studies. In In-situ investigation of movements of gases produced from decomposing refuse; final report. Publication No. 35. Sacramento, The Resources Agency, 1967. pt. II (p.1-9).

In order to compare gas movement in the soil from full-scale refuse fills with that at the Azusa test site, gas sampling wells were drilled in the vicinity of the large landfills at Palos Verdes and at Calabasas, and gas analyses were made at these locations. In order to measure the gas concentration gradients at Palos Verdes and to estimate the rates of gas movement in the ground near this large County refuse fill, three 4½-in. wells were drilled to a 100-ft depth. Results were tabulated. Data indicate that sizable concentrations of carbon dioxide exist both laterally and with depth around the fill. It is shown that carbon dioxide concentration increases with depth at the two outer wells, suggesting that the gas concentration contours are bulb-shaped around the fill with decreasing concentrations going outward from the fill. It is expected that the direction of this gradient would reverse itself at greater depths where concentration would decrease going downward. The bulb shape is consistent with outward diffusion in all directions away from the refuse. Relationships among the three landfills regarding carbon dioxide movement are shown indicating the transfer rate at each fill and its comparison with Azusa. Only one out of four ratios was severely out of line, and this was for movement upward for which it was difficult to measure accurately all the variables involved. The results show that for movement downward into the ground the rates of transfer are almost of the same order of magnitude.

67-1102

California State Water Quality Control Board. Other studies. In In-situ investigation of movements of gases produced from decomposing refuse; final report. Publication No. 35. Sacramento, The Resources Agency, 1967. pt. III (p.1-9).

The Special Study Refuse Fill made an ideal site for studying horizontal movement of combustible gases and was selected for this purpose after preliminary field study. Twenty-four gas sampling probes were installed 2 ft into the ground throughout the community. The locations of these probes were chosen in such a way that gas analyses would yield data for defining the extent and intensity of gas penetration into the community. The relative locations of the fill, the adjacent community, and the gas sampling probes are shown. After a period of about a week, gas samples were extracted from these shallow probes and analyzed in a gas chromatograph. The results are tabulated. The extent to which both carbon dioxide and methane travel laterally outward from the large refuse fill is strikingly apparent; at distances of 300 to 400 ft from the fill edge the maximum concentrations of both carbon dioxide and methane were found. A special laboratory device was designed and built for measuring the carbon dioxide transfer rate across a given sheet of barrier material. The procedure is described. Two leachate samples were collected and analyzed for their pollution potentiality. Results are tabulated. A special study provided a good test for the surface monitoring technique using the titration modification, and it indicated again the general magnitude of the carbon dioxide transfer rate through a fill cover. Using this monitoring technique, it is now possible to determine rather rapidly the escape rate at several surface locations.

67-1103

California State Water Quality Control Board. Discussion. *In* In-situ investigation of movements of gases produced from decomposing refuse; final report. Publication No. 35. Sacramento, The Resources Agency, 1967. pt. IV (p.1-4).

The object of the 4½-year study was to determine the generation and movement of refuse gases, the extent of potential hazard of these gases to groundwater, and workable control procedures for protecting groundwater. The three phases are discussed. It is concluded that carbon dioxide emanating downward over a period of many years from refuse fills does pose a positive threat to groundwater because of its relatively high solubility in water. Methane gas also poses a hazard, although perhaps not as much to groundwater; however, it becomes a fire hazard when it passes through the soil and is trapped beneath closed spaces in combination with air to form explosive mixtures. The asphalt membrane developed and described was shown to be an effective barrier against carbon dioxide movement, especially with respect to fire hazards. No conclusive answers yet exist on how much water will percolate through a landfill under surface irrigation or from rainfall, although some information is available. The potential hazard due to percolation of surface water is primarily governed by the impervious nature of the fill cover and by the presence of settlement cracks and ponding areas on the fill surface and on the refuse soil interface along the edges. Subsoil instrumentation can be installed to indicate imminent leaching from the surface. Refuse gases pose a more serious pollution hazard than leachate.

67-1104

Carlson, T. R. Mount Trashmore rises from an old clay pit. American City, 82(7):45, July 1967.

Twenty years ago the City of Evanston, Illinois, began a sanitary landfill project with a 55-acre clayhole. This site has now been converted into a 65-ft hill with the descriptive name of 'Mount Trashmore'. The hill, which is a popular sledding area, has two toboggan runs, an advanced coasting area, and a smaller one for little children. The hill also houses a school, playground, tennis courts, and baseball diamond. An ice skating area, a warming house, and concession stand are planned for next season. This landfill operation was so successful, that Evanston is attempting to acquire another pit, an old gravel deposit, which will serve as a sanitary landfill for 10 years. It is then slated to become a park, incorporating similar facilities.

67-1105

Collection crisis mounts. Refuse Removal Journal, 10(6):10, 26, 38, June 1967.

Brisbane, California, has prohibited the Sanitary Fill Co. from disposing of San Francisco's refuse at an 105-acre landfill site originally promised. The contractors have 6 months to appeal the decision in the District Court of Appeals. Judge Underwood said the landfill enhanced the value of the tidelands owned by Sanitary Fill. Sanitary Fill had already drained the dike area, planted trees, and built fences. Golden Gate Disposal spent more than $1 million to find alternate sites and concluded that there were none. Barging refuse out to sea is impractical for it eventually filters back along the shorelines. Incineration is being studied. Brisbane feels very independent about any talk of money and claims they would not miss the $30,000 a year because half of it went to policing the landfill. If an $8 million incinerator is approved, it would increase the life of the landfill from 6 to 20 years with the reduced volume of residue. In 6 months Brisbane's disposal site (ironically, a bay site at South San Francisco) will be exhausted.

67-1106

Cook, H. A., D. L. Cromwell, and H. A. Wilson. Microorganisms in household refuse and seepage water from sanitary landfills. Proceedings of the West Virginia Academy of Science, 39:107-114, 1967.

Studies were undertaken to isolate and identify some of the microorganisms found in seepage that often flows from sanitary landfills and that may be involved in the decomposition of household refuse in sanitary landfills. Bacteria, actinomycetes, and filamentous fungi were isolated from fresh and partially decomposed household refuse and seepage, and identified. Most of the bacteria were aerobic, mesophilic forms belonging to the genera Bacillus and Lactobacillus and the anaerobic, to Clostridium and Bacillus. Enterobacteriaceae were isolated from refuse and seepage. The mesophilic actinomycete isolates from refuse belonged to the genus Streptomyces as did most of the isolates from seepage. However, species of Micromonospora and Nocardia were also found in seepage as well as the thermophilic genus Thermomonospora. The fungal isolates were predominantly species of Asperigillus and Penicillium and most of the algae in seepage were species of Oscillatoria and Chlorococcum. It was shown that microbial differences exist between sanitary landfill seepage before and after it leaves the landfill. A number of factors influence these differences, chief among the factors probably being the soluble materials in the leachate which furnish inorganic elements to the microflora as well as soluble organic matter to the nonphotosynthetic microorganisms.

67-1107

Counselling service guides landfill development. Public Works, 98(2):136, Feb. 1967.

Everett, Washington, employed the counselling service of National Disposal Service, Barrington, Illinois. Under the contract, National Disposal made a land survey of the disposal site, which was an open burning dump, and a design showing the projection of grades to be attained by the completed landfill. Other services performed included technical assistance on equipment, plan for conversion of the dump to a landfill system, and methods of controlling receipts and fees. For these services the city pays a fee based on the total cubic yards of refuse delivered to the site.

67-1108

County sued over landfill blast death. Refuse Removal Journal, 10(2):39, Feb. 1967.

The wife of a man killed by an explosion at a King County, Washington, landfill is sueing the county for neglecting to have an attendant inspect, control, or supervise dumping operations.

67-1109

Dair, F. R. The effect of solid waste landfills on ground water quality. In Proceedings; Sixth Biennial Conference on Ground Water Recharge, Development and Management, Berkeley, Sept. 13-14, 1967. University of California. p.136-140.

Ground water pollution due to solid waste landfills has been the subject of much investigation during the past two decades in Southern California. The studies have developed a wealth of valuable information but have produced few answers about better methods of constructing or operating landfills. The effect of solid waste landfills on ground water is discussed in three cases. The first case is one in which the wastes are deposited at such a low level as to be in direct contact with the ground water; the ground water quality in the immediate vicinity of the fill is substantially degraded. The second case involves the leaching of a landfill by percolating water from either rainfall or irrigation which subsequently travels further downward to the ground water. Tests indicate that leachate is not a serious problem in a properly-constructed landfill with controlled irrigation. The third case is that of gas migrating from the fill to the ground water. In general a fill will produce methane and carbon dioxide. It was found that carbon dioxide will migrate for great distances, both laterally and downward from a fill. More research, aimed at producing quantitative data and developing better techniques of landfill construction, needs to be done.

67-1110

Erhard, H. Fundamentals about sanitary landfills. Staedtehygiene, 18(6):117-119, June 1967.

A survey is presented of the historical development of laws and regulations concerning establishing and using sanitary landfills. As early as 1894 a handbook of hygiene was published containing a chapter on public cleansing. Roehrecke was the first to point out the importance of the aerobic decomposition of waste. The waste should be deposited in loose layers not thicker than 2 m in order to allow air to penetrate. The chemical processes occurring in landfills were investigated in Great Britain by Jones and Owen in 1930 and in Germany by Thiesing and Naumann in 1935. For the rotting process a humidity of 30 to 60 percent is essential while a temperature of up to 80 C is necessary to destroy pathogenic microorganisms. This temperature can be generated by the rotting process itself. Best results are obtained by crushing the waste prior to deposition. Sixteen references are given. (Text-German)

67-1111

Evans, H. A new idea in landfill operation. American City, 82(3):114-115, Mar. 1967.

King County, Washington, has enacted a new system of landfill conservation on a county-wide basis. A major obstacle such a system will encounter is coordinating the individual collectors. To facilitate this problem King County purchased forty flatbed trailers pulled by sixteen tractors, and ninety containers (two per trailer) with 42-cu-yd capacities. The refuse is compacted in 15-ft trenches by a new Mole tractor, which can compact the rubbish to one-tenth of its original volume. The Mole can also be equipped with a hopper with a capacity of 84 cu yd (two containers). The 15-ft trenches help conserve the landfill areas, prevent scattering of debris, and can easily be covered and transformed into fruitful recreation or park areas.

67-1112

Finding the best place to bury our past. Testing World, (21):6-7, Winter 1967-1968.

Sanitary landfilling is a method of burying solid wastes in vacant tracts which are reclaimed for other uses. Nationally, 500,000 tons of refuse are produced daily. Open burning and dumping are sources of air and water pollution and breed rodents and insects. Incineration costs four times as much as landfilling and residue must still be disposed of. Composting is not widely used. Thus, sanitary landfilling seems the most acceptable and most widely used method of disposal presently available. A hillside or bank, flat land, and a hole or ravine are suitable for sanitary landfills. The site is investigated to find: flow and elevation of the water table; site topography; soil character and permeability; bedrock depth; relationship of surface water to the site; and location and depth of wells in the area. Thus air and water contamination can be avoided and adequate drainage assured. There should be enough earth in the area to assure 5-in. daily cover and 2-ft final cover. Seismic and resistivity instruments are used to locate strata of clay, sand, and gravel; only one boring is necessary and this one need be only a sample hand-auger boring, rather than a split spoon or Shelby tube sample. To avoid fires, rodents, and contamination, the refuse should be thoroughly compacted. It is possible to find non-compacted areas by calibrating the seismograph for a given type of material, then comparing the velocity reading to the known density of that material.

67-1113

Gershowitz, H. The National Council: wins landfill exemption. Refuse Removal Journal, 10(10):50, Oct. 1967.

The struggle to change the Highway Beautification Act of 1965, with respect to sanitary landfilling, hints of success for the solid wastes industry. The Senate Public Works Committee, at the urging of NCRDTA, has secured an exemption for operating sanitary landfill in the implementation of the Highway Beautification Act on the basis that sanitary landfill cannot be economically operated if classified as a junkyard. The House Public Works Committee (Subcommittee on Roads) also agrees that sanitary landfill should be exempt, and is seriously considering rewording the legislation to define a sanitary landfill as 'a method of disposing of refuse on land without creating nuisance or hazards to public health or safety by utilizing the principles of engineering to confine the refuse to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of earth at the conclusion of each day's operation or at such more frequent intervals as may be necessary.'

67-1114

Hattery, G. S. Get out of the dumps ... and win friends and industry in the process. American City, 82(6):100-101, June 1967.

Sanitary landfills cost more in direct operating costs, but are less expensive if one considers side benefits of increased land values and elimination of health hazards. The Medina, Ohio, landfill uses the area fill method on the lower part and trench method on the upper part. A 2-ft cover of earth is put over a 6-ft layer of compacted refuse. All bulky items are buried as soon as unloaded to eliminate scavenging and undesirable pests. Snow fences control blowing paper. Residential and commercial customers pay for collection. When filled, the area will be a park.

67-1115

Hernandez, G. Deep-hole method extends landfill use. American City, 82(3):17, Mar. 1967.

Lafayette, Indiana (pop. 67,230), has recently enacted a sanitary landfill conservation project called the 'deep-hole method' of solid waste disposal. Formerly unuseable lowlands are being revamped into 40-ft pits, six times the average depth of sanitary landfills. Lafayette also acquired the use of Hough H-100A loader-compactor with a 3½-cu-yd bucket, which can compact twice the volume of refuse per cubic yard than previously. At the end of each day, the compacted refuse is covered with 6 in. of fill dirt, preventing the scattering of debris into residential sections. When each lowland area has been exhausted, Lafayette plans to turn the land into a city recreation area, extracting two useful purposes from previous wasteland.

67-1116

Holheuzer, O. Steel wheel dozer improves landfill compaction. Public Works, 98(4):115, Apr. 1967.

Galveston, Texas, handles 700,000 cu yd per year of wet garbage with a 30-acre plot. For landfill compaction, Galveston uses a rubber-tired tractor dozer, a Michigan Model 180 Series III which has four steel wheels mounted over the tires. After refuse has been burned and metals removed with an electromagnet, the dozer makes no more than two passes over the same spot. However, the flat lugs of the steel wheels leave a rough surface in sand that is open to moisture so a grid-type roller might be more effective. In clay this imprint would not matter.

67-1117

Homes settle and crack on old fill. Refuse Removal Journal, 10(1):39, Jan. 1967.

Twelve row houses in Bronx, New York City, are sinking into the swampy refuse fill on which they were built 7 years ago because they were built on a landfill too loosely packed and with insufficient construction foundations.

67-1118

How to win friends and get a landfill site approved. Refuse Removal Journal, 10(4):10, 37, Apr. 1967.

Private contractors in Saginaw, Michigan, established a landfill after overcoming opposition. Wilson Garbage wanted to buy a 90-acre lot 11 miles off its routes. In court he was given permission, but the township appealed the case to a higher court where the contractor was overruled. However, Wilson trucks used the site anyway. A warrant was issued and the case went to circuit court where the Michigan State Health Department chief engineer described the reclamation value of landfills. Judges said the township had the right to prohibit landfills. Contractors and township supervisors had a meeting. If contractors could not get land for fills, each municipality would have to find areas of its own. The supervisors agreed to contractor-owned fills.

67-1119

Keams, J. T. Ripper chews through frozen clay. American City, 82(2):60, Feb. 1967.

The sanitary landfill principle is an extremely efficient one, but ideal soil conditions aren't always available. Two detriments to the efficient operation of sanitary landfills are cold weather and/or hard soil. Champaign, Illinois, has largely remedied their problems with the addition of a bulldozer with ripper-type teeth attached to the rear of the machine. The bulldozer also uses a 14-ft, U-shaped blade on its front. The city is also aware of the acute conservation problems concerning sanitary landfills. Fifteen years ago, Champaign sectioned 90 acres of land about 2½ miles from the residential area, of which 49 acres have yet to be touched. This figure is far below the quoted land requirement of 7 acres per year per 10,000 persons.

67-1120

Koch, A. S. Plans for 8,150 tons per day at landfill. Refuse Removal Journal, 10(8):14, 21, Aug. 1967.

In 1953, Orange County, California, banned refuse burning because it contributed to air pollution. The conclusion of a 1959 report was that the sanitary landfill method of disposal, utilizing the natural canyon formations in the foothills bordering the county, would be the most significant means of handling ultimate refuse disposal requirements, despite the fact that most people were in the 'long haul zone.' It was determined that a system of four refuse transfer stations, located in that zone, could substantially reduce the cost of haul. Refuse originating outside Orange County, liquid, and industrial waste are not accepted. The use of transfer stations is limited to commercial refuse collectors and municipal vehicles. Refuse at the landfill is placed in lifts approximately 15 ft in depth with crawler tractors. The material is covered daily with approximately 1 ft of dirt. Self-propelled rubber-tired scrapers are used to haul and apply the necessary cover material. Their transfer stations consist of ground level unloading docks. Refuse is dumped from these docks through hoppers into the transfer trailers. It is spread and compacted by a Drott Hydraulic Back Hoe. Of the 3,700 tons of refuse disposed of daily at the county's landfill, 1,600 are hauled by the transfer system. The remaining 2,100 tons are unloaded by refuse contractors and the public. Average costs per ton are: Landfill--$0.60, Transfer--$2.10, Combined average--$1.08.

67-1121

Landfill conversion attracts new industries to Ohio town. Refuse Removal Journal, 10(9):82, Sept. 1967.

The City of Solon, Ohio, has attracted new industry and lowered the tax rate since it converted an open dump into a self-supporting sanitary landfill area. Engineering studies showed that the old dump which consisted of a 1,000-ft open face, would be completely covered in 5 years as a dump. As a compacted sanitary landfill area, the same area would serve the community for the next 25 years. A plan was therefore drawn up to convert the entire 90-acre tract into a sanitary landfill. The sanitary landfill currently accepts between 500 and 600 loads per month. They average about 10 cu yd per load. The fill also accepts contractor-collected refuse from Solon industries and the entire waste load from certain nearby communities. Private vehicles from Solon are charged $4 to $10 per load up to 49 cu yd, while the nonresident rate runs from $5 to $12. The entire operation is paid for by dumping fees from industry and nonresident users. The only cost to the city is operating the packer for residential pickup.

67-1122

Landfill to add 15 islands with 268 million cubic yards. Refuse Removal Journal, 10(10):32, Oct. 1967.

A landfill project is underway in Tokyo to expand its port facilities. Fifteen islands, with a total land area of 5,546 acres, are being built by utilizing more than 268 million cu yd of fill. The operation is to be completed by 1970, with all the planned construction to be finished by 1975. In two of the newly created islands there has been sufficient settlement to permit work to begin. The finished development is to include a railroad yard, a truck terminal able to serve 6,000 vehicles and 12,000 tons of goods a day, and harbor facilities for 47 ocean-going ships and 115 smaller vessels to handle more than 72 million tons of cargo per year. The seven main islands of the project are to be linked by a 14-lane road connected to Tokyo's network of expressways. The total cost is estimated at $300 million. Part of this expense will be financed by the sale of the reclaimed land. The average price has been set at about $35 a sq yd.

67-1123

Making sanitary landfills sanitary. Public Works, 98(5):7, May 1967.

Good operation of a landfill is essentially no more costly than poor operation. State health departments should prepare a handbook and provide site inspections by sanitary engineers to reduce the occurrence of air pollution and vermin.

67-1124

Mendoza, E. San Diego extends life of its landfill. Western City, 43(5):49, May 1967.

Every city which operates landfills is interested in getting the maximum number of years out of any such facility. A Pactor Trashmaster Compactor with an air-conditioned cab was placed into operation at one of the three landfills and has increased the degree of compaction. The compactor is not as flexible as the conventional crawler tractor, but it fits into the overall operation with planning. San Diego's refuse disposal effort includes the operation of three landfills: the Miramar Fill, the Chollas Fill, and the Arizona Fill. The total cost for refuse disposal to the city is $421,472 per yd or an overall refuse disposal cost of $1.26 per ton. In 1966 to 1967, it is estimated that 60,000 tons of city refuse will be brought into the Miramar Fill, with another 60,000 tons from other users.

67-1125

Merz, R. C., and R. Stone. Progress report on study of percolation through a landfill. Public Works, 98(12):86-87, 148, 150, Dec. 1967.

The effect of simulated rainfall in a non-arid region with regard to rainfall penetration on sanitary landfill operations was studied experimentally in Los Angeles, California. Refuse placed in the cell came from the city's residents and consisted of 65 percent paper, 25 percent grass and garden trimmings, 5 percent garbage, and 5 percent inerts. The cell (as diagrammed) was formed by cutting into undisturbed earth similar to decomposed shale. Refuse was placed continually to a depth of 19 ft, while water which was consistent with the precipitation pattern for Seattle in 1961 was added. A 2-ft cover of earth was then set in position. Moisture content readings of cell material were taken by core samples at 2-ft depth increments. In the 2-year period covered by the research account, 130 in. of water was applied (87 in. tap water, 43 in. rainfall). This total also represents an accidental additional 53 in. of water due to massive, unintentional flooding. Coring data revealed an average moisture content of 115 percent on a dry weight basis in August, 1966, and 89 percent in February, 1967. A general drying out of the cell occurred during the time of the planned program of water application.

67-1126

Mix sewage sludge with waste at landfill. Refuse Removal Journal, 10(3):30-31, Mar. 1967.

The placing of sludge over the face of tipped refuse restricted the amount of airborne paper, fly emergence, and interference by vandals in Preston, England. The need for more economies drew attention to the possibility of disposal of raw liquid sludges directly into the refuse. In September, 1965, it was decided to create profiles and raise land levels by the tipping of refuse and, by the use of the flood bank, to create a pit into which raw sludges could be pumped for a trial disposal scheme.

67-1127

More planning needed for refuse disposal. Public Cleansing, 57(5):271-276, May 1967.

At a joint meeting of the Midland Centre of the Institute and the East Midlands Centre of the Association of Public Health Inspectors, Mr. J. Henry Barrett spoke on refuse disposal by tipping. The following main requirements were indicated: need for coordinated action; need to set up a coordinating committee to analyse the problem; carry out a detailed survey to assess potentialities of certain areas; preparation of master tipping plan; preparation of master plan for land reclamation; and implementation of the master plan in accordance with a preconceived program. In answer to questions during the discussion period, Mr. Barrett said he was not happy about the tipping of great heaps of refuse; tipping was less expensive than incineration; vegetation should be planted on the tip as soon as possible; and surveys should be carried out for best results for future tip areas.

67-1128

Mounts campaign to counter disposal objections. Refuse Removal Journal, 10(8):24, 43, Aug. 1967.

The City Council of Calgary, Alberta, Canada, intends to acquire four sanitary landfill areas, one in each corner of the city. Citizens raised the following objections: refuse trucks are unwelcome; dumps become feeding grounds for flies; smell of refuse can't be controlled after hours; and landfill sites could contaminate nearby wells. The City council says sanitary landfill sites: result in huge savings because it's cheaper to bury than burn refuse; allow closing of an incinerator, a cause of air pollution; and convert old excavation sites and depressions into useable property. The landfill method costs 73 cents a ton while incineration costs $2.80 a ton plus a further $1 a ton for amortization of the plant. Of the total refuse in that year, 66,266 tons were incombustible and could not be put into the incinerator. City Hall has promised that all landfill sites will be enclosed by fences. No refuse will be left uncovered at night in the present landfill sites. Waste will be dumped into huge trenches, packed down with a tractor and then covered with a film of soil. Present sites will be exhausted in 3 years.

67-1129

Park mountain from dump. Refuse Removal Journal, 10(1):37, Jan. 1967.

West Berlin is turning 'Devil's Hill,' a 350-ft-high refuse dump, into a park.

67-1130

Recommended standards for sanitary landfills. New Mexico Department of Public Health, Apr. 1967. 8 p.

The design of a proposed sanitary landfill should include a topographic map, and plans should shew all irrigation systems, domestic water wells, and buildings on or within 300 ft of the exterior boundary of the site. The landfill should be limited to areas where there will be no danger of water pollution. Adequate numbers, types, and sizes of equipment should be specified for the operating of the landfill, including fuel storage facilities. All weather access roads, telephone communication, and fire protection must be provided. A suitable shelter and sanitary facility is needed for personnel working at the site. Access to the sanitary landfill should be limited to those times when an attendant is on duty. A sign should be conspicuously posted at the entrance to the disposal site, indicating pertinent information concerning operation. Unloading of refuse is confined to an area which will be covered at the close of the day. At least 6 in. of cover material must be added daily and whenever a cell contains 8 ft or less of compacted fill it must be covered with a minimum of 2 ft of compacted soil. When a cell contains over 8 ft of compacted fill, it should be covered with a minimum of 3 ft of compacted soil. A fence must surround the site and suitable dust and rodent control measures taken. Sewage solids and hazardous materials should be disposed of only after special permits have been issued. A separate unloading area may be used for bulky wastes. No salvage material may be separated or stored at the site.

67-1131

Ross, C. B. Economics and aesthetics of New Jersey landfill reviewed. Refuse Removal Journal, 10(12):22, Dec. 1967.

When Neptune Township opened New Jersey's first sanitary landfill on Jan. 2, 1952, it took some diplomacy to still the clamor of residents and to convince Township committeemen to put up capital appropriations. Now the site is a valuable piece of reclaimed land, with a new municipal building, a new public works garage, and a playground and ballfield for the high school. Benefits have been multifold. Gone is a swampy, rat-infested, mosquito-breeding, valueless piece of real estate. Taxpayers have benefited by having available an inexpensive fill site. Contracts from six or seven shore communities were originally made at $1 a ton, so the community realized several thousand dollars in users fees annually. Users now pay $2.75 a ton. Today, 60 vehicles a day bring in an average of 128 tons of refuse, which is soon covered with soil. Other communities have followed Neptune's example, with Elizabeth, Mount Holly, Little Ferry, and Lyndhurst among them.

67-1132

Ross, C. B. Landfills transform eyesores into productive community assets. Public Health News, 48(9):201-202, Sept. 1967.

New Jersey's first sanitary landfill was opened in 1952, a swamp land pesthole site filled in with garbage, trash, and inorganic and organic wastes. Today, the reclaimed 50 acres are used for playground and ballfield, a municipal building, and a public works garage. It has been a paying proposition. The charge to neighboring communities who use the landfill, initially $1 a ton, is now $2.75 a ton; 60 trucks a day bring in an average of 128 tons of refuse and trash. Ten-ton bulldozers cover the waste with soil, burying it in a sanitary manner. Communities all over New Jersey are turning to sanitary landfills to dispose of garbage, dry trash, and noncombustible rubbish. The results have been a profitable utilization of marginal land and construction of new public parks, airports, parking lots, golf courses, and shopping centers. About 12,600 tons of household garbage and refuse are disposed of daily at 417 landfills, plus 7,500 tons of commercial and industrial refuse from New York City and Philadelphia. Out of a total of 38 incinerators constructed by municipalities, only nine are operational today, and most of these are inadequate to handle the refuse produced locally.

67-1133

Sanitary landfill: big decision for small towns. Nation's Cities, 5(2):15-17, Feb. 1967.

The collection and disposal of garbage, refuse, and junk is an increasing problem, since more than half of all American cities with populations over 2,500 do not have nuisance-free, sanitary facilities for the disposal of solid wastes. Among the alternatives to open dumping and open burning, sanitary landfilling and incineration are the most common, although the cost of incineration is often prohibitive for a small town. There are now 1,400 cities in the United States using sanitary landfills, having been attracted to their use by the low cost, the reduction in rodent and vermin breeding, the acceptance of most solid waste except bulky trash, raw sewage sludge, and garbage. The covering of the compacted refuse with a layer of earth at least once a day avoids the serious health threats represented by open burning and dumping. Photographs show the nuisance created by open burning of trash, the variety of disposable containers, the growth of automobile graveyards, and the results of weakly enforced laws. The Public Health Service has a program to assist local, state, and private agencies in the improvement of disposal practices for solid wastes. The Public Health Service is also investigating the feasibility of converting wastes into a landfill material which will not decay and will have one tenth of the original volume. The use of sanitary landfill offers promise to the small community.

67-1134

Self-supporting landfill helps attract industry. Public Works, 98(3):116, Mar. 1967.

Engineering studies showed that a 90-acre area would be completely covered if used as a dump as it had been, but as a compacted sanitary landfill it could serve Solon, Ohio, for 25 years. The landfill accepts 500 to 600 loads of 10 cu yd each per month. The entire operation is paid for by dumping fees from industry and nonresident users, thereby lowering the tax rate and attracting industries.

67-1135

Stickelberger, D. Thoughts on problems with bulky wastes and sanitary landfills. Staedtehygiene, 18(6):130-133, June 1967.

Sanitary landfill is by far the least expensive of all waste disposal methods. Its costs are approximately between 38 cents and $1.30 per ton of waste while composting ranges between $4.20 and $8 per ton of waste and incineration between $7 and $9 per ton of waste. Sixty-five percent of all U.S. cities with a population of more than 10,000 resort to dumping. In West Germany 97 percent of the entire waste is dumped into landfills. But the problem is that in most cases the sanitary landfills are not sanitary at all. They attract flies in masses, are highly flammable because of an increasing amount of paper and packing material among the waste, and spread pungent odors. All these nuisances can be eliminated rather inexpensively by crushing the waste and loosely piling it up. This simple method does not take care of bulky wastes, however. In this case a method is recommended by which the smaller waste is crushed in a slowly rotating drum which at the same time separates the homogenized waste from the coarser waste. The bulky waste is spread out in a layer which is subsequently covered by the crushed waste. A power shovel is necessary for spreading, compacting, and covering the waste layers. The costs of this method of orderly dumping lie between $1 and $2.80, which is between dumping and composting. (Text-German)

67-1136

Suburb attempts to halt San Francisco landfill project. Refuse Removal Journal, 10(1):6-8, Jan. 1967.

Brisbane set up roadblocks to prevent San Francisco refuse trucks from unloading into the new landfill. Brisbane had initially approved the site but later sought to revoke the land use permit. Sanitary Fill Company had diked off 105 acres, drained it, planted trees and built fences. The 'Brisbane Citizens for Civic Progress', 'doesn't want the Bay to become a dump site'. The Bay Conservation and Development Commission recommends that San Francisco develop a transfer refuse disposal system to transport waste to inland sites and halt filling in the Bay. Since the battle began, Brisbane has had to tighten its budget and double the tax rate not only because of loss of the monthly dumping fee but also because of lawyers' fees and court costs.

67-1137

Summers, Gary O. Landfill method of solid waste disposal. In Proceedings; Solid Waste in Urban Environments--a Community Action Seminar, Houston, Mar. 9, 1967. University of Houston. p.59-61.

A sanitary landfill is well adapted for small cities that wish to cope with sanitation and pollution problems and find the financing of an incinerator difficult. In Bellaire, Texas, 75 acres were acquired at a cost of $50,000, 7 miles from the city limits. Bellaire has a population of 20,000 people and is completely surrounded by the City of Houston. The land on which the landfill is located is almost flat and has only a few feet of slope from the front side to the back. Since the ditches are not allowed to drain into the bayou, a pumping problem ensues. About 2 acres of land per year are used to bury all of the solid waste, including garbage, limbs, and other bulky items. An incinerator, built on the landfill site, would reduce the volume of waste and the remaining land would last for more than 100 years instead of 20 years. The cost of picking up the garbage and hauling it to the landfill equals approximately $4 per capita per year. The operation of the landfill equals approximately $1 per capita per year. A leased dragline digs long ditches 30 ft wide and about 8 ft deep. The trucks dump their loads at the end of the day, the bulldozer hauls dirt which has been dug from the ditches, and places a 4-in. layer as a cover. When the ditch is finally filled, it is covered with a 3-ft layer of dirt. The landfill has been used as a recreational area.

67-1138

Tip talk at N. W. meeting. Public Cleansing, 57(6):309-312, June 1967.

At the North Western Centre meeting Mr. Fearenside presented a paper entitled 'Controlled Tipping - How Can It Continue?' He said that it was time to think of new methods of refuse disposal. With an annual decrease in dust and cinder of 8.66 percent and an increase in paper and vegetable matter of 5.13 percent, crude refuse could not be tipped in a hygienic matter with no covering. Pre-treatment was the answer. Since incineration with special treatment apparatus was expensive and only 20 percent of the refuse was suitable for composting, pulverization was the answer. Pulverization resulted in volumetric reduction between 30 and 50 percent. Generally there was sufficient derelict land for tipping. During the discussion which followed, Mr. Jolly (Leigh) said he believed that full incineration would be more farsighted. Also in favor of incineration were Mr. Whitfield (Warrington), Mr. Sutcliffe (Bury), and Mr. Bevan (Manchester).

67-1139

Tipping of crude refuse no longer acceptable--Midland Centre recommendation. Public Cleansing, 57(11):609-611, Nov. 1967.

The proceedings at an open meeting of the Midland Centre at Birmingham, England, on September 15, 1967, which considered evidence to be submitted to the General Council of the Institute for consideration by the Working Party Report on Refuse Disposal, were reported. It was generally agreed that dumping of crude house refuse is no longer acceptable. All such refuse should be mechanically treated before being dumped. Incineration, pulverization, costs of various methods of disposal, and waste heat utilization were among the topics discussed by the speakers.

67-1140
Vote on California landfill. Refuse Removal Journal, 10(10):12,40, Oct. 1967.

Litigations concerning a 105-acre disposal site developed by the Sanitary Fill Company and located near Brisbane, California, are described. The Company purchased the acreage from the town, developed it, and was granted a use permit and contract. Under it, Sanitary Fill paid the town of Brisbane $50,000 and consented to a $2,500 monthly fee for the life of the site. A group of Brisbane residents fought this move and in early 1965 forced a special election to pass an ordinance disallowing filling. That September, an initiative ordinance forbidding dumping went into effect. The Brisbane council also rezoned the area, so as to preclude refuse disposal and rescinded the use and grading permit that was previously approved. Sanitary Fill questioned these moves in court and in the ensuing court test the San Mateo County Superior Court ruled in Brisbane's favor. The Company then filed an appeal with the State District Court of Appeals in San Francisco. This court granted another stay, pending its hearing on the case. Meanwhile a group of Brisbane residents filed a petition calling for a referendum to decide the fate of the company's offer to pay the City of Brisbane $100,000 yearly to use the refuse disposal site. The election will be held on Oct. 17, 1967.

STREET CLEANING

67-1141
Burnett, B., J. Mynderse, and S. Jacklich. Street cleaning practices today. In Proceedings; Fifth Annual Seminar and Equipment Show, Governmental Refuse Collection and Disposal Association, San Francisco, Nov. 9-11, 1967. p.90-92.

Street cleaning in Bakersfield and Newport Beach, California, is described. Bakersfield has 200 miles of streets and a crew of five sweepers. Streets are cleaned according to a system based on traffic count. A special leaf operation is employed from October to January to handle about 800 tons of leaves. The main problem in Newport Beach, a city of 40,000 people with 250,000 summer visitors, is sweeping around parked cars.

67-1142
Clark, D. T. 16 years of sweeping at $1.26 per mile. American City, 82(2):57, Feb. 1967.

The Town of St. Johnsbury, Vermont, pays about $1.26 per curb mile to clean its streets. Tabulated data detail ownership costs, assuming a 10 percent resale value, and all operating costs. The town purchased a Model 40 Austin-Western sweeper in February 1949, and has since swept 17,500 curb miles over 16 years. Total repair and replacement costs have amounted to less than $1,000, or about $62 a season. This economical performance is attributed in part to the conveyorless design of the machine--the pickup (rear) broom carries dirt and debris over a deflector bar arrangement directly into the hopper. Other helpful features include the tricycle steer and the location of the hopper behind the driver.
An intensive spring clean-up in April covers about 78 miles of streets. During the summertime schedules; the crews cover about 60 curb miles per week for a total of 1,020 curb miles over the 17-week season.

67-1143
Dietrich, H. Street cleaning in municipalities of Baden-Wuerttemberg, West Germany--a comparative investigation for the year 1965. Staedtehygiene, 18(10):231-234, Oct. 1967.

Due to the lack of competition, street cleaning tends to become inefficient, uneconomic, and cumbersome. Comparative investigations were conducted in 1965 in 19 Baden-Wuerttemberg municipalities. They were divided into two groups: those with a population of less than 70,000 and the rest. The cost calculations of all cities with a population of more than 70,000, and of a representative cross section of the rest, are tabulated. The results show that the per capita costs for street cleaning in the individual municipalities with a population of more than 70,000 range from 5.6 DM to 13.3 DM; in municipalities with less than 70,000 inhabitants, between 6.2 DM and 15.4 DM. The lower per capita costs in the larger municipalities indicate that a more mechanized cleaning method with less personnel is employed. However, only a very carefully planned schedule for the use of sweepers is economical. In three tables the sweeping costs per kilometer (ranging between 5.7 and 21 DM) and per hour (ranging between 15.50 DM and 33 DM) for small sweeping machines, as well as the costs per hour for street cleaning trucks below 3 tons (costs ranging between 2.7 and 19.63 DM) and above 3 tons (costs ranging between 3.47 and 12.70 DM), are listed for the various participating municipalities. The tables indicate that in most cases too many and too large vehicles are used. Standardization, and the use of small, maneuverable, fast vehicles must be the aim. (Text-German)

67-1144

Edelhoff, G. D. Private enterprise and the problems of city cleaning. Staedtehygiene, 18(6):133-135, June 1967.

Following the last war, a trend was begun in which municipalities contracted private businesses to take care of city cleansing. Formerly, communities with populations of less than 15,000 were the most apt to follow this trend. Now, however, communities with up to 50,000 or 60,000 inhabitants are discontinuing public cleansing services. The primary reason for this development is the fact that private enterprises can expand their activities to surrounding communities, thereby increasing their efficiency and reducing overhead charges. Furthermore, private businesses pay taxes to the communities. Thus the use of private versus public services for city cleansing generally results in savings of about 25 percent for domestic wastes handling, 50 percent for industrial wastes handling, and 50 percent for sewage sludge removal. (Text-German)

67-1145

Hahn, R. E. Low-cost leaf collection without special equipment. American City, 82(4):54, Apr. 1967.

West Allis, Wisconsin, which has about 160 miles of streets with two-thirds of these dominated by towering elms, has solved its leaf-collection problem by the use of two steel ramps attached to three packer-type refuse collection trucks. After jeeps with rakes push the leaves into piles, the ramp is attached to the truck by two easily-removed pins and the rear end is raised for transport by chains attached to the packing arms. The truck parks near the pile and the jeep pushes the leaves up the ramp into the hopper. The truck driver operates the packing mechanism and one or two helpers clean up the ragged edges of the pile. When the truck is loaded, the men detach the ramp and connect it to the next truck. During an average haul of one mile, three refuse trucks can keep two loading crews busy. Loading with a vacuum unit or front end loader was not as efficient and caused dust problems.

67-1146

Hart, C. J. Collect twice the leaves with the same crew. American City, 82(4):116-117, Apr. 1967.

Massapequa Park, Long Island, New York, is using a new machine consisting of two of their older Good Road leaf collectors on a single axle chassis. Mounted engines are perpendicular to the trailer axle, not parallel. This puts the fan in front, providing better balance. A 6-ft-wide nozzle is connected to the fans. The hitch is longer than usual to provide more working space for leaf rakers between the tow truck and the leaf collector. The eye of the hitch lines up with the left side of the machine rather than with the center. Two new boxes to receive leaves were constructed of angle iron and plywood. Cloth over the opening prevents dust from blowing into the street and over the rakers. The boxes can be dismantled for easy storage. The new machine requires no nozzle man. A triangular deflection shoe was installed in the center of the nozzle to deflect leaves to the ports. A flail-type mulcher will be added in the nozzle to pulverize the leaves before they are blown into the receiving box. This will increase the load.

67-1147

Job-matched sweepers for the freeways. American City, 82(7):13, July 1967.

California has recently added some Wayne four-wheel sweepers to supplement its three-wheel fleet. The advantage of the four-wheel Model 940 is that it can operate at 45 mph, while the top speed of the three-wheelers is 20 to 25 mph. However, the three-wheeled units have the advantage of maneuverability. Therefore an intelligent matching of these two units to the task to be performed improves the standard of maintenance, saves money and reduces the hazard to traffic.

67-1148

Kohn, R. E. Leaf burning. Scientist and Citizen, 9(4):1-5, Apr. 1967.

Clayton, Missouri, a St. Louis suburb was chosen as the subject city for a benefit/cost analysis of leaf-burning. Five aspects were evaluated: the benefits of avoiding pollution; the benefits of avoiding other leaf-burning hazards; the cost of controlling leaf-burning; the possible recovery of by-products; and the effects that leaf-mulching will have on this control cost. The benefits and costs were computed separately. Results showed that benefits derived from not burning leaves totaled $22.50 per ton. Leaves could be collected and disposed of for $6.60 per ton. The benefit/cost ratio for eliminating leaf-burning pollution is approximately 3:4. Also, collected leaves may be utilized for mulch. Thus, municipal leaf collection can result in economic gains for both homeowners and municipalities since leaves like other waste products can be converted into a useful resource.

67-1149

Large power sweeper. Modern Maintenance Management, 19(3):34, Mar. 1967.

A hydraulic-drive, heavy-duty sweeper can pick up cans, bottles, wood, paper, and metal up to 3 in. in diameter. A broom sweeps the debris. The doors of the hopper open hydraulically for dumping. It is virtually maintenance free.

67-1150

Leaf collection: growing public works problem. Public Works, 98(7):95-98, July 1967.

In a survey by the editors of 'Public Works,' a number of northern New Jersey communities were queried on the size and nature of leaf removal programs. Questionnaires were sent to cities or boroughs with a population of 10,000 to 50,000, and replies were received from 56 public works departments, 36 of which now carry out leaf collection programs of some sort. The tabulated data show the name of the community; its population; number of sweepers, end loaders, vacuum loaders, dump trucks, and larger trucks used; curb miles serviced; cubic yards collected; personnel; manhours; and cost. As an example of a good program, the leaf collection program of Ridgewood, with a population of 30,000, is detailed. Last year 28,000 cu yd of leaves were collected from 190 curb miles of streets at a labor cost of $14,900. Problems in leaf collection include concealment of heavy objects under the leaves, bad weather conditions, and disposal of the leaves. The survey showed that many communities intend to institute municipal leaf collection.

67-1151

Leaf collection and disposal is another problem. Public Works, 98(5):7, May 1967.

Officials are trying to reduce air pollution by prohibiting burning leaves. Other means for collection and disposal must be provided. Fall rains and winds can upset schedules and overflow gutters. The volume of leaves is great and many dumping areas are already filled. Composting is helpful in some cases but not in many.

67-1152

Leaf vacuum teams with refuse packer truck. American City, 82(3):55, Mar. 1967.

Albuquerque, New Mexico, has hitched a leaf vacuum machine to a 2-ton refuse packer truck to facilitate removal of leaves from streets and alleys. Use of the packer permits the loading of 1½ tons of leaves before a trip must be made to the sanitary landfill area to unload. The packer system allows a load five times heavier than the load obtained with an open truck. The city plans to adapt its other two vacuum machines to packer rigs to speed the leaf-season cleanup.

67-1153

A litter fighter goes to work on Belleville streets. Civic Administration, 19(2):33, Dec. 1967.

A $400 vacuum cleaner equipped with a 30-in. cleaning width, 4-in. intake, and a 3-hp engine can even pick up cigarette butts and dust from Belleville, Ontario, streets. The machine has a 11½-cu-ft capacity. Contents are dumped into seven new trash cans which are emptied regularly.

Street Cleaning

67-1154

London Centre at Dorking and Horley. Public Cleansing, 57(5):247-248, May 1967.

The emphasis at the meeting of the London Centre held at Dorking and Horley was on the production of Johnston Bros. tanks used in connection with their suction sweepers and also for the Johnston Atumat high pressure sewer cleaner. Members had the opportunity to view the asphalt plant and drawing offices, and to discuss technical aspects of the machines. They also saw a special rubber conveyor used at the base of specially constructed hoppers in chutes in multi-story dwellings. The members also saw the Tollemache refuse disposal plant at work with special interest to the interior of the pulverizer.

67-1155

Magnetic sweepers for safe driving. American City, 82(3):55, Mar. 1967.

The New Jersey Turnpike Authority has tested magnetic sweepers to improve safety on the highway. Trucks tow the sweepers at 10 to 15 mph to collect metal debris from the shoulders and center strip. To remove the collected tramp iron, which consists mostly of nails and bolts, from the sweeper, the driver merely turns off the current and it is deposited on the ground.

67-1156

Medal for the beauty and cleanliness of city areas. Staedtehygiene, 18(4):94, Apr. 1967.

The city of Freiburg, West Germany, plans to grant a medal of honor to land and house owners for keeping their premises clean and for beautifying their houses by freshly painting them and decorating them with flowers. The city fathers hope that this competition will contribute to clearing the city from ugly wastes along pedestrian walks and streets. (Text-German)

67-1157

Molinari, P. Street cleansing: problems of street cleansing in relation to traffic and parked automobiles, problems of snow clearing in towns. In Proceedings; INTAPUC Ninth International Conference, Paris, June 26-30, 1967. International Association of Public Cleansing. p.183-223.

Several European and North American cities and one North African city were studied, and results are presented in tabular form and discussed. Quantity and type of litter are given and preventative measures are discussed. Cleaning frequency and time of cleaning in various cities is given, labor force and mechanical equipment are described. The influence of traffic conditions on cleaning, parking regulations in various cities, and parking plans to allow mechanized cleaning are discussed. Snow and ice clearance is also covered. Losses in revenues due to snow, and costs of snow removal, snow removal equipment and labor force are given for several cities. Photographs of cleaning equipment are included.

67-1158

Molinari, P. Summary of national reports on street cleansing. In Proceedings; INTAPUC Ninth International Conference, Paris, June 26-30, 1967. International Association of Public Cleansing. p.225-277.

Reports from various countries on street cleaning are given. The reports contain statistics on traffic patterns, parking regulations, vehicle density, and information on street cleaning equipment and procedures. Information on snow removal is included. These reports form the basis of the preceding article 'Street Cleansing: Problems of Street Cleansing in Relation to Traffic and Parked Automobiles, Problems of Snow Clearing in Towns' by P. Molinari. Countries included are Austria, Belgium, Canada, Czechoslovakia, Denmark, Finland, Great Britain, Italy (Bologna), Norway, Poland, Sweden, Tunisia, and the United States.

67-1159

Moore, E. Eliminated: one expensive rehandling operation. American City, 82(8):76-77, July 1967.

Improved street cleaning operations in Baltimore are described. Addition of nine

Wayne 940 four-wheel sweepers has provided better clean-up at reduced cost. These sweepers clean the streets and haul the debris directly to the landfills, thereby eliminating an expensive rehandling operation that required several trucks to haul the debris to the disposal areas. These sweepers also clean debris deposited after rainstorms in gutters and intersections, and median strips are cleaned for the first time mechanically. Prohibition of parking on both sides of the street in many areas during the early morning hours, has facilitated curb cleaning. While street cleaning has expanded with the advent of these nine additional sweepers, the number of employees in the bureau has remained constant. This has been accomplished by tightening refuse collection routes and by the use of eight new Ford dump trucks with Daybrook mechanical tailgate lifts requiring only three men, for the collection of heavy objects.

67-1160

New sweeper much improved. Public Cleansing, 57(11):598, Nov. 1967.

The Mark III version of the KEF 936 driver-operated sweeping machine is now available. Minor modifications have been made throughout to ensure that this new sweeper will give better service and need less maintenance. Its main improvement over earlier models is an easily removable main broom assembly, making brush replacement fast and simple. A cover on one side is quickly removed, allowing the brush assembly to slide out. The twelve removable brush strips can be changed as required, and the whole assembly replaced. The new machine has a full electrical harness and many optional extras can now be fitted to the Mark III sweeper, including an all-weather cab, flashing warning light, and half-ton refuse trailer. The power source can be a gasoline, diesel, or propane motor, as required.

67-1161

Organization of private city cleaning companies. Staedtehygiene, 18(12):294, Dec. 1967.

An organization of private city cleaning companies was founded in September 1961. The member companies of the organization try to fulfill their share in the task of keeping the cities clean. They make every effort to adjust their methods to the increasing demands. They own more than a thousand street sweepers and take care of the waste of about 15 million people. Private companies are in charge of eliminating 20 million cu m of wastes of the total 50 million cu m accumulating annually. The 20 million cu m of waste are made up of 5 million cu m of household waste, 10 million cu m of industrial waste and 5 million cu m of sludge. (Text-German)

67-1162

Over the ton on the footpath. Public Cleansing, 57(1):19-20, Jan. 1967.

Mechanical equipment used for street cleansing and clearing on footpaths may exceed the 1-ton limit in certain areas, providing area Gas Boards are consulted if their pipes lie beneath the footpath and the use of heavier equipment is unlikely to cause damage to the pipes.

67-1163

Pole promotes clean-up. American City, 82(5):44, May 1967.

Since wind would whip up trash out of the mouths of drums, the City Manager of San Dimas, California, purchased aluminum receptacles to hang from street poles for smaller objects. Their only maintenance is a bi-monthly washing.

67-1164

Street cleaning operations in Kenosha. Public Works, 98(7):140, July 1967.

Street cleaning operations in Kenosha, Wisconsin, are described. The city utilizes four mechanical sweepers, one truck, and one front-end loader to sweep its 14,395 miles of streets. The sweepers clean the two commerical routes daily and the 18 residential routes about once a week; 3,010 sweeper dumps containing 10,530 cu yd of dirt were disposed of by the pick-up crew. A Vac-All scavenger was used to pick up leaves during the fall season and for spring clean-up. Two jeeps equipped with pusher screens were used to pile leaves in the fall.

67-1165

Swets, D. H. Sweeping costs reduced 12%. American City, 82(6):24, June 1967.

Diesel-engine street sweepers that can dump their loads directly into truck boxes have cut the curb-mile cost of street cleaning in Kalamazoo, Michigan, by 12 percent. Two of the city's four sweepers are Elgin Pelicans powered by GM 4-53 diesel engines. When the hoppers of these units become full, the operators rendezvous with a dump truck and load the debris directly into the truck box. This eliminates the need for a front-end loader or a self-loader on the truck. Even though the diesel engines cost more initially, the differential in fuel costs pays for the extra initial outlay in a short time.

67-1166

Task force picks up tons of street debris while city sleeps. Refuse Removal Journal, 10(1):37, Jan. 1967.

Each night eighty-five men in Los Angeles clean up 1,300 tons of paper, plastic bags, and rubber dust ground from autos. Equipment includes 26 motor sweepers, 14 motor flushers, and 13 dump trucks.

TRAINING, EDUCATION, AND PUBLIC RELATIONS

67-1167

Announce 1967's first eight grants and program budget. Refuse Removal Journal, 10(6):31, June 1967.

The first eight P.H.S. solid waste grants of 1967 have been awarded: Baltimore, Maryland,--$28,600, to convert a strip mine into a landfill; Virginia Beach, Virginia, --$120,200, to make an amphitheater, coasting hill, and lake from a landfill; $28,000 to set up a county-wide system in Maricopa County, Arizona; $66,330 to Los Angeles County, California, for development of guidelines for landfill operation; Bridgeport, Connecticut,--$181,600, for new techniques in incineration; San Jose and Santa Clara County, California,--$85,000, for separation of non-burnables and grinding and crushing of burnables before incineration; and Raleigh, North Carolina,--$27,800, for use of computers in selecting a solid waste management system.

67-1168

Build first lab for solid waste study. Refuse Removal Journal, 10(2):36, Feb. 1967.

The first field laboratory for research on solid waste pollution control will be built at the University of Cincinnati.

67-1169

Drexel gets grant to study solid waste disposal pollution. APWA Reporter, 34(10):20, 21, Oct. 1967.

The U.S. Public Health Service has awarded a $68,900 grant to Drexel Institute of Technology as the first year cost of a 3-year research project aimed at reducing water pollution caused by solid waste disposal in the heavily populated areas from New York City to Washington, D.C. The water pollution research will involve both laboratory and field studies, and initial work will deal with the character and rate of pollutants going into underlying soil and rock. To facilitate these studies, two tanks are being built to hold artificial landfills in the Drexel laboratories. These will be used to simulate conditions at the center of a large sanitary landfill. Wind, temperature, and rainfall will be induced artificially at the tops of the tanks, and instruments will monitor temperature change, the formation of gases, moisture movements, and other conditions inside. A 100-ft square section on one corner of a landfill to be built in southeastern Pennsylvania will be isolated for the field research study. Changing temperature conditions within the fill will be recorded, and soil, gases, and water from wells to be installed in the area will be sampled and analyzed. Data obtained will be used in designing a mathematical model, using a digital computer to provide solutions to equations expressing the hydraulic functioning of sanitary landfills. Success in this aspect of the research will make it possible for engineers to predict the movement of moisture through fills in advance of construction.

67-1170

The education of engineers in environmental health. Report of a WHO expert committee. World Health Organization Technical Report Series, No.376:1-26, 1967.

A report of the meeting of a WHO Expert Committee on the Education of Engineers in Environmental Health in Geneva on July 4-10, 1967, is presented. The changing scope of environmental health and the part it plays in social and economic development, as well as the many unresolved and new techniques, such as information sciences and system concepts, were emphasized. The training and education of environmental engineers and the impact of research on education were discussed.

The problems and requirements of educational health engineers were noted. The report concludes with a list of recommendations for a long-range, comprehensive educational program for environmental health engineers.

67-1171

Establish first field laboratory for solid waste research. APWA Reporter, 34(4):6, Apr. 1967.

The Solid Wastes Field Laboratory which was established under a 5-year land-use permit at the University of Cincinnati will operate as a research facility. Its aim is to eliminate health hazards due to solid wastes. The land-use agreement will permit the Public Health Service to construct roads and buildings and to conduct research on: the control of air pollution from solid waste incineration; the design and operation of sanitary landfills; and other problems related to the protection of human health and environment from solid waste contamination.

67-1172

New field laboratory for solid-waste research. American City, 82(4):45, Apr. 1967.

The Public Health Service will construct the first field laboratory on solid waste pollution abatement. The laboratory, which will be on the University of Cincinnati campus, will study: air pollution from incinerators, refuse deterioration in the environment, sanitary landfills, and control of ground and surface water pollution.

67-1173

New refuse-disposal study. American City, 82(1):42, Jan. 1967.

The U.S. Department of Health, Education, and Welfare awarded a $154,000 contract to evaluate solid waste disposal practices in 21 States and to estimate the amount of solid-waste reduction facilities required for the next decade.

67-1174

New research projects. Public Cleansing, 57(10):549-550, Oct. 1967.

Two research projects for which grants were awarded by the U.S. Public Health Service are described. The Midwest Research Institute, Kansas City, Missouri, has been awarded a $53,975 contract to study solid waste disposal problems associated with packaging, and to find ways to minimize them. A $42,724 grant has been made to the University of Pennsylvania, to explore the use of pipelines in the collection and transportation of garbage, trash, and other solid wastes from homes, industries, and farms to disposal sites. The following phases of pipeline transportation will be studied: experimentation with different refuse mixtures at varying particle sizes and concentrations to obtain data to provide a basis for determining the extent to which characteristic movements of solid waste slurries in pipes may be similar to movements of other water-borne solids in pipes; analysis of variations in waste sources, composition, and quantities in terms of their significance for pipe system designs; and the determination of pipeline costs both in absolute terms and in comparison with alternative conventional collection and transportation systems.

67-1175

One day seminars for solid waste. Refuse Removal Journal, 10(2):24, Feb. 1967.

One-day solid waste orientation seminars will be conducted by State and Federal health authorities sponsored by the Public Health Service to familiarize officials with solid waste management, collection, and disposal.

67-1176

Rensselaer gets solid waste training grant. APWA Reporter, 34(8):20, Aug. 1967.

The amount of $35,000, awarded by the Solid Wastes Program of the Public Health Service's National Center for Urban and Industrial Health to the Rensselaer Polytechnic Institute, is the largest of eight grants awarded to such institutions of higher education for the training of graduate students for administrative or planning careers in solid wastes management. A $45,400 grant, to cover the second year of a training program at the Drexel Institute of Technology in Philadelphia, brings to nearly $500,000 the total awarded to date for solid wastes training at the university level. Other institutions with grant-supported solid wastes training programs are: University of Florida, Georgia Institute of Technology, University of Kansas, University of Michigan, University of Texas, and University of West Virginia. The training in solid wastes is for candidates for master's degrees and, at one university, for students working on doctorates. About one-third of each grant is for student support, including stipends, tuition and fees.

67-1177

Research with respect to solid wastes in the United States. Techniques et Sciences Municipales, 62(12):439-440, Dec. 1967.

A new series of grants has recently been issued for research projects under the Solid Wastes Program. These investigations will be more specific than previous general studies on refuse disposal have been. The city of Los Angeles has received a $760,000 grant for a 3-year study of an incinerator that would meet rigid air pollution requirements while employing minimum control equipment. The test incinerator will have a 100- to 150-ton-per day capacity. This project is governed by the scarcity of disposal sites in the region, and by the necessity for halting contamination of the San Francisco Bay. A $25,000 subsidy has been granted to the Citrus Agricultural Experiment Station at Lake Alfred, Florida, in order to develop a conversion and utilization process for citrus wastes. The envisaged process includes dilution of citrus molasses with waste water in order to make food for livestock and to produce citric acid by fermentation. In the same series of grants, Purdue University was awarded a grant for study on aerobic digestion of slurry and stable dung; and the University of Illinois was granted aid for an investigation on treating commercial stable wastes with Pasveer trenches and stabilization ponds. Government funds will also help finance the University of Maryland's research on utilizing the tomato plant wastes that represent ten million tons of possible nourishment. Various other government-subsidized research projects are named that will investigate specific aspects of waste disposal, collection, or utilization. (Text-French)

67-1178

Solid waste research projects. American City, 82(6):63, June 1967.

Solid waste demonstration projects have been set up to study technology for disposal or managment systems. A Barrington, Rhode Island, project studies disposal by bag for sanitary landfills. A Madison, Wisconsin, project studies reduction of volume by the Gondard process. Movement of groundwater into and leachate away from landfills is studied at the University of Illinois. A refuse-burying compactor that reclaims unusable land is demonstrated in King County, Washington. West Virginia University is using fluidized-bed techniques. Washington, Douglas, and Sarpy Counties, Nebraska, are promoting gully-reclamation landfills. Stamford, Connecticut, is constructing an incinerator. Santa Clara, California, is using aerobic, high-rate, and composting test cells. Bergen County, New Jersey, is trying to recover the heat from an incinerator as a source of power. California Department of Public Health is planning a management system. Bridgeport, Connecticut is studying hazards of disposing of volatile substances. Gainesville, Florida, is demonstrating a composting system. Washington, D.C., is studying air-pollution control, heat recovery, metal recovery, and a compression press in incinerators. Virginia Beach, Virginia, is constructing a hill of refuse for an amphitheater. Los Angeles County, California, is trying to control gas movements and leachate from landfills. Maryland State Department of Health wants to use abandoned strip mines for landfills. Raleigh, North Carolina, is applying a mathematical simulation model to landfill selection. Broome County, New York, is operating a countywide disposal program.

67-1179

Solid wastes. Public Works, 98(1):101-102, Jan. 1967.

The demonstration and research grants authorized under the Solid Waste Disposal Act of 1965 and awarded by the Office of Solid Waste of the U.S. Public Health Service, include: the development of data to aid in judging suitability of disposal sites in glaciated areas; development of a countrywide system for disposing of wastes, including paper mill wastes; the testing of a high-pressure waste compaction process in producing non-decayable land reclamation material; testing the newly developed 'Gondard' method for processing refuse; development of a regional system using a combination of processes for disposing of sewage sludge, cannery refuse and all other solid wastes; a demonstration of the practicality of burning bulk wastes, such as tree stumps, in multi-purpose incinerators; and the demonstration of a newly developed mechanical composting system for medium-sized cities.

67-1180

Solid wastes field laboratory. Environmental Science & Technology, 1(2):109, Feb. 1967.

A new Public Health Service field laboratory is being built to study the control of air pollution from solid waste incineration, deterioration of refuse in the environment, design and operation of sanitary landfills, and control of ground and surface water pollution caused by solid waste.

67-1181

32 States now getting USPHS planning funds. APWA Reporter, 34(8):19, Aug. 1967.

New grants to Delaware, Florida, Kansas, Michigan, Minnesota, Montana, and North Dakota bring to 32 the number of States now participating in solid waste disposal planning. USPHS Solid Wastes Program funds cover up to 50 percent of the cost of developing these plans. The grants will finance the first year of a 3-year planning effort.

67-1182

University of Michigan offers solid waste graduate course. Refuse Removal Journal, 10(6):38, June 1967.

The Public Health Service awarded funds to the University of Michigan to admit ten students for the year for a graduate level training program in solid wastes. The program includes: urban and regional planning, air pollution, water pollution, ground and surface water, administration, and systems analysis.

67-1183

Zemlansky, J. New Jersey reviews training program and long term evaluation of sanitary landfill. Refuse Removal Journal, 10(11):22, 34, Nov. 1967.

Solid waste disposal in the sixties is not something that can be conveniently put aside, for by 1970 every person will produce 5 lb of wastes daily instead of the current 4 lb. Financed by a $50,000 grant from the United States Public Health Service, the New Jersey State Department of Health has launched a training program to triple the number of trainees skilled in modern waste techniques. Sanitary landfills throughout the State are also being surveyed for location, size, ownership, costs of collection and disposal, landfill potential, manpower, equipment, and other factors. A similar study is being completed of incinerator facilities--including such factors as size, tonnage, design, method of burning, and cost per ton.

HEALTH/SAFETY

67-1184

Barnett, S. A. Rats. Scientific American, 216(1):78-85, Jan. 1967.

Rattus norvegicus, the common brown rat, has small ears, a thick, short tail, weighs approximately 1 lb, attains a 9-in. length, and is a highly injurious and universal pest. This burrowing animal lives underground near sewers and streams. Norvegicus survives almost entirely in human environments due to its exploratory habits, insatiable curiosity, neophobic behavior, and propensity to eat what man does. Males, being desirous of sexual dominance, are especially combative in the presence of females; peace is only assured by establishing a three-tiered hierarchial structure within the colony, safeguarded by signals of posture, bodily contact, and odor. This amiability, however, does not extend toward stranger rats. Group members will show 'territorial behavior' by individually attacking all intruders to specific regions. Fights are unlike human combats for the attacked (who usually die for some unknown reason, because physical injuries are generally minor) will not retaliate against the aggressor's leaps and bites. Signals guide the rat's communal living; odors tell the male to attempt coitus, squeaks warn of danger to the babies. Laboratory norvegicus, though domesticated, cannot respond to many normal social signs. From them, nevertheless, it has been learned (as shown in data) that all rats do not cooperate, are constantly restless, cannot distinguish subtle differences, and thrive on novelty.

67-1185

Bo, G. and C. Meloni. Research on the hygiene conditions of inhabitants in three rural zones of Oltrepo Pavese. Annali Della Sanita Pubblica, 28(2):315-319, Mar.-Apr. 1967.

Research was conducted on the nutritional and public health conditions of three villages near Pavia, Italy. Simple standards were drawn up for the inhabitants of each room, and hygienic conditions were considered in relation to number of individuals or families per lodging. Location of dwelling, type of walls and flooring, and natural light conditions were determined; waste disposal methods were evaluated; and general cleanliness taken into account in the overall rating. In addition to ratings of comfortable, adequate, and inadequate, inspection disclosed some permanently inhabitable dwellings, as well as others that could be renovated. (Text-Italian)

67-1186

California Department of Industrial Relations. Disabling work injuries in refuse collection. In Work injuries in California. San Francisco, Bureau of Labor Statistics and Research, 1967. p.3-9.

The wide variety of hazards to employees engaged in refuse collection are reflected in the industry's manual workmen's compensation premium rate, $8.05 per $100 payroll. This is four times the rate for all manual classifications taken together. For 1967, the estimated injury rate for privately operated refuse collection services was 180.9 disabling injuries per 1,000 employees, nearly six times the average rate for all California industries taken as a group. A review of employers' reports of lost-time injuries in public and private refuse collection during a recent 6-month period in California showed a total of 784 lost-time injuries in refuse collection. Back strains represented the leading single type of injury sustained by refuse collectors, accounting for about one-fourth of the injuries recorded. Ankle sprains accounted for 7 percent of the disabling injuries in garbage collection. More than half the lost-time injuries in refuse collection involved containers and more than one-third involved refuse trucks. Fifty-seven percent of the slips and falls recorded in garbage collection services were falls from the refuse trucks. Although only about 7 percent of the lost-time injuries to garbage collectors involved the packer unit or the dump mechanism, contact with these units hold the potential for serious or even fatal injury. From 1964 to 1967, on-the-job accidents claimed the lives of 15 Californians employed in collection services.

67-1187

Committee on Environmental Health Activities, Sanitary Engineering Division, ASCE. Review of 'A strategy for a livable environment'. Journal of the Sanitary Engineering Division, Proceedings, American Society of Civil Engineers, 93(SA6):171-179, Dec. 1967.

The recommendations of the Task Force on Environmental Health appointed by the Secretary of Health, Education, and Welfare are examined by the Committee on Environmental Health Activities of the Sanitary Engineering Division, ASCE. The recommendations describe 10 Action Goals and 24 supporting actions which the Task Force states will constitute a desirable strategy for fulfilling the Department's responsibilities in environmental health. The Action Goals identify important existing problems, describe specific tasks for dealing with them, and set target dates by which the goals are to be attained. The strategy for the long-range program requires a reshaping of the Health, Education, and Welfare organization which will stress the task or function to be performed rather than the category of the health worker's specialized field. It emphasizes the need for generalists as opposed to specialists and calls for the training and use of ecologists who will be concerned with evaluation and management of a comprehensive environmental health program. The Committee on Environmental Health Activities supports recommendations on the need for the generalist. However, it believes that the type of generalist needed is not one originally trained as such, but rather the former specialist who has demonstrated extraordinary ability through his broad interests, knowledge, vision, aggressiveness, and management talent. In the Committee's opinion, the specialist is unnecessarily and unwisely downgraded by the Task Force. Further, it believes that the emphasis given to the need for the ecologist in environmental health programs is not realistic and detracts from the value of the Report.

67-1188

Golueke, C. G., and P. H. McGauhey. Public health. In Comprehensive studies of solid wastes management; first annual report. Sanitary Engineering Research Laboratory Report No. 67-7. Berkeley, University of California, May 1967. p.75-92.

The public health aspect of the study has the following objectives: evaluating the relationship between waste management and public health, reviewing public health regulations relating to waste management, advising other teams of the health implications in their proposals, considering the components of waste in relation to health, and evaluating the occupational hazards of the workers in the field. Examples of various areas of study are: high nitrogen and trace metal contamination in run-off waters from areas with large amounts of animal manures; dangerous materials from industrial plants which may find their way into landfills; the contribution to air pollution by incinerators; various environmental contamination possibilities of landfills; and the types of bacteria that survive composting procedures. The occupational hazards of refuse collectors include arthritis, cardiovascular disease, muscle ailments, hernia, and injuries. Tables show various possible health hazards from different disposal schemes, including air pollutant emissions from incinerators and open fires, broken down by constituent gases; concentration of components leached out of landfills; and estimates of pollution levels for various landfill depths by various rainfall levels.

67-1189

Grodhaus, G. Identification of Chironomid midges commonly associated with waste stabilization lagoons in California. California Vector Views, 14(1):1-12, Jan. 1967.

Since midges of the family Chironomidae, which often emerge in extremely large numbers from waste stabilization lagoons, constitute a nuisance when lagoons are located near residential areas, surveys have been undertaken to study the midge population levels. In this study, illustrations, brief descriptions, and keys are provided for the identification of larvae, pupae, and adults. The immature stages of some of the lagoon-inhabiting species are described. Characters visible under low magnification are emphasized in the keys. The species included are Tanypus carinatus Sublette, T. grodhausi Sublette, Procladius sp., Cricotopus sp., Goeldichironomus holoprasinus (Goeldi), Chironomus stigmaterus Say, Chironomus attenuatus Walker, Chironomus sp., and Glyptotendipes barbipes (Staeger).

67-1190

Izmerov, N. F. WHO and environmental health. World Health Organization Chronicle, 21(8):336-342, Aug. 1967.

The contributions made by WHO to various parameters of environmental health, which included community water supply, water pollution, waste disposal, air pollution, and house hygiene, were discussed. The technical and advisory assistance of WHO to member countries in regard to the satisfactory collection, treatment, and disposal of industrial waste, and solid and liquid waste products, has increased considerably. For instance, a 50 percent reduction in the diarrhea and enteritis death rate in Costa Rica over an 8-year period has been attributed to the installation of more than 10,000 privies. WHO has helped in drawing up plans for carrying out sewage and refuse disposal projects in Manila, Ibadan, Bangkok, and elsewhere. It has also helped the Government of Malta to prepare a plan for the combined treatment of sewage, sludge, and refuse, to produce compost for use as manure. In 1965 it published a guide on the construction and operation of waste stabilization ponds. In December 1966 it convened a Scientific Group on the Treatment and Disposal of Wastes, which stressed the problem of waste disposal in both developed and developing countries and its implications for health. It emphasized research on: a simplified method of waste collection, treatment, and disposal that would make the best use of local resources in manpower and materials; the management and disposal of waste water solids; the recovery and recycling of liquid and solid wastes; methods of waste management on the site; as well as the collection and dissemination of information on research into better methods of waste treatment and disposal.

67-1191

Jamieson, S. Rubbish dumps. New Zealand Journal of Agriculture, 115(4):32, Oct. 1967.

Garbage disposal in New Zealand, which is fundamentally a farming country, is described. A basic danger lies in the spread of animal disease, a recent example being trichinosis. Half of the country's 427 rubbish dumps are inadequately proofed against the possible spread of animal diseases, according to a recent survey made by the Animal Health Division of the Department of Agriculture. Although the ideal solution is the abolition of dumps as they currently exist, and the incineration, rather than burial, of all waste materials, smoke contamination of the atmosphere and cost of incinerators present problems. The increasing need for efficient garbage disposal is emphasized.

67-1192

Markham, J. W. An occupational health service in a transport and cleansing department. Presented at Institute of Public Cleansing 69th Annual Conference, Blackpool, England, June 1967. 15 p.

General aims of an occupational health service are stated. Experiences of such a service for the Bristol Transport and Cleansing Department (800 people) and City Engineer's Department are described. The health service personnel familiarized themselves with the jobs of the department, established personal contact with supervisors, publicized the service among the employees, and emphasized that nothing would interfere with the employee's relationship with his own doctor. Specific examples of job rehabilitation after illness or injury are given. A discussion of chronic bronchitis as an occupational disease of Transport and Cleansing Department employees is included. A doctor's report on the health conditions of refuse collecting, gathered from personal observation of the job, is presented. Sanitary and medical recommendations based on the report are cited. Noise and dust hazards in refuse processing plants are discussed briefly. Equipment and supplies for a first aid room are listed.

67-1193

1967 Findings of the environmental sanitation survey of Gainesville. Aedes Aegypti Eradication Project, Georgia Department of Public Health. 24 p.

This survey was undertaken to determine environmental conditions and sanitation deficiencies, promote public acceptance of recognized sanitation standards through public education, and secure citizen support and cooperation in correcting sanitation deficiencies. The survey revealed a number of sanitation deficiencies. Of the 5,601 premises surveyed, 1,270, or 21 percent, were judged to be unapproved due to an insufficient number of containers, missing lids, etc. Inspection on a routine basis should be instigated to maintain proper container usage. The present landfill, with a minimum of expense and using the present equipment, could be made into a sanitary landfill. Additional trucks, power equipment, and manpower should be furnished the sanitation department to assist in a clean-up program. The present vehicle ordinances should be amended to provide for the removal of junked automobiles on private premises, and should be retroactive to provide for the removal of such vehicles. Elimination of rubbish, privies, and poor refuse sanitation practices are the essential elements in rodent and fly control programs. It is recommended that a community project be started to clean up all vacant areas within the city limits.

67-1194

Prindle, R. A. Health aspects of solid waste disposal. In L. Weaver, ed. Proceedings; Surgeon General's Conference on Solid Waste Managment for Metropolitan Washington, July 19-20. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.15-20.

Solid waste disposal is fundamentally a health problem. Open dumps breed vermin and disease, open air burning causes air pollution, burying causes water pollution, and accidents are caused by poor refuse handling practices. Sanitation workers have an extremely high injury frequency rate, twice as high as firemen and policemen and above stevedores. Results and recommendations of a comprehensive literature survey done by Aerojet-General under a Public Health Service Grant are discussed. Special work is needed on the problem of chemical wastes. Educational and legal programs are also needed.

67-1195

Results of a survey on municipal safety programs. APWA Reporter, 34(12):3-7, Dec. 1967.

The American Public Works Association and the National Safety Council have distributed about 3,200 questionnaires to American municipalities having populations of 5,000 or more. The questionnaire asked for information on safety programs, the benefits which cities with safety programs have derived, the number of public employees receiving the protection of such programs, the cost of operating each program, and the adequacy of accident records kept. Of the 548 respondents, 245 cities (about 45%) indicated they had some type of safety program; this percentage is appreciably higher than the 9 percent found in a 1951 survey. Safety programs in several cities are credited with helping to reduce compensation costs. Since most cities absorb the cost of safety programs in the budgets of various city departments, no useful conclusions can be made. Interestingly, the titles given to the officials responsible for safety programs were not similar. Of the 245 cities that reported the existence of a safety program, only 39 kept acceptable data on their accidents.

67-1196

Rogers, P. A., R. A. Sawinski, J. E. Brooks, et al. Public health aspects of refuse collection. In Proceedings; Fifth Annual Seminar and Equipment Show, Governmental Refuse Collection and Disposal Association, San Francisco, Nov. 9-11, 1967. p.4-32.

The proceedings of a panel discussion are presented. Solid waste and its relationships to the environment were discussed. California's disposal practices are unsatisfactory from an environmental standpoint since 75 percent of disposal sites in the State are open burning dumps. The Federal Solid Wastes Program was discussed and the Solid Waste Disposal Act examined. Work being done under demonstration and research grants provided by the act is described. Public health aspects of solid wastes and rodents were discussed. Metal garbage cans with tight lids are the best residential preventative. Daily covering of wastes with compacted soil is the best disposal site practice. Plague, leptospirosis, and salmonella are spread by rats, and tetanus can result from bites. Studies on green blow fly populations in garbage cans show that garbage should be collected twice a week during the fly season and cans should be clean. Daily covering of landfills is necessary. Burning is the greatest problem in air pollution. California's Mulford-Carrell Air Resources Act is outlined. Water can be affected by solid wastes through physical means (floating debris), through leachate, and through gas production.

67-1197

Safety for collection workers. APWA Reporter, 34(7):27, July 1967.

A serious accident experienced by a garbage collector is outlined. Almost every safety survey conducted has shown refuse collection workers to be among work groups with the highest accident rates. It is therefore recommended that every person connected with a collection operation must be thoroughly safety conscious. Constant training and re-training of collectors, foremen, and supervisors, must be conducted so that recognizing and avoiding hazards are as instinctive as breathing. While foremen are responsible for the safety of their men, it is the responsibility of their superiors to make sure that time and materials are available to enable them to perform this important part of their job.

67-1198

Star, S. Safety for refuse collection systems. In Proceedings; Fifth Annual Seminar and Equipment Show, Governmental Refuse Collection and Disposal Association, San Francisco, Nov. 9-11, 1967. p.33-41.

Hazards in refuse collection systems are discussed. Human errors outweigh mechanical failures as a cause of accidents. Common types of injuries and safety rules and practices are listed. Men should be trained in proper methods of lifting, use of machinery, and sanitation habits. Load packers and their safety factors are described including: rotary blade type, escalator-conveyor loader, pack master, ejector packing blade, and bucket loader. Hazards of open body trucks are outlined. These are most unsatisfactory and their use should be discontinued. Operation of a scooter system in conjunction with 50-cu-yd trucks in Pasadena reduced worker fatigue and incidence of back injuries.

67-1199
Sume, C. The 'tool' in refuse collection safety. In Proceedings; Fifth Annual Seminar and Equipment Show, Governmental Refuse Collection and Disposal Association, San Francisco, Nov. 9-11, 1967. p.93-94.

Safety experience of a refuse collection worker depends on his frame of mind and this should be determined by questionnaires at the time of application. Prework training is important and use of protective clothing, equipment, and tools should be stressed. Films and slides can be useful in accident prevention.

LITTER

67-1200
America's beauty is everyone's duty. U.S. Steel News, 32(5):12-13, July-Aug. 1967.

The interest of the U.S. Steel Co. in controlling litter is presented. Practical hints for positive steps that can be taken to prevent litter are given. One photograph shows a recreation area which has been used as a dump and another shows the use of a company supplied litterbag in a company car by an employee. A poster is shown for use on the safety bulletin board which emphasizes that 'Good Housekeeping is Important Outside Our Company - Keep America Beautiful.' Another poster shows a scenic picture of Mt. Ranier with the message asking that outdoor manners be improved and the natural beauties be preserved by preventing litter. Since 1953, Keep America Beautiful, Inc., a national beautification organization, has received financial support from business, labor, and trade organizations. U.S. Steel has always stressed good housekeeping around its plants. Litter-prevention activities include the use of litterbags or baskets in company vehicles, adequate trash receptacles in and around plants, and bulletin board campaigns. Trash receptacles are important in reducing the litter on streets, beaches, schools, and other public areas. Because of strong structural characteristics, many of the litter receptacles are made of steel. The program for employees includes keeping their own homes and properties clean, keeping recreation areas litter-free after use, using litterbags in cars or boats, urging public officials to provide adequate collection and disposal facilities, and working with others to eliminate litter in the community.

67-1201
Anti litter drive in New Zealand 'fails'. Refuse Removal Journal, 10(10):39, Oct. 1967.

To impress upon shoppers just how much rubbish they were scattering along the streets, the borough council of Kawerau, New Zealand instituted a 'dirty fortnight'. In that time the council staff would empty the litter baskets, but would not sweep the streets. It was expected that by the end of the 2-week period the streets would be covered with rubbish. However, the people made it a point to use the litter baskets, and at the end of the fortnight there was very little to clean up.

67-1202
Beach sanitation methods reviewed. Public Works, 98(3):119-122, Mar. 1967.

Hand labor is often required to remove litter on public beaches. Trash receptacles are to be generously provided. The hazard of broken glass is minimized by prohibition of glass bottles in beach areas. Crawler and utility tractors are used in California. The Allis-Chalmers Beach Sanitizer is helpful, and sand-sifting equipment is often needed. Beaches in Florida are cleaned with motor graders, tractors with hay rakes, garbage trains, and sanitizers, and by hand. Driftwood is burned. Seaweed is windrowed and buried in the sand to dehydrate. New Jersey debris consists of large timbers, piling, and wrecked craft which must be sawed into lengths that can be manhandled.

67-1203
Doctrow, D. Litter lecture. American Glass Review, 87(13):7, June 1967.

This editorial draws attention to the numerous disposal problems created by the wide acceptance of non-returnable bottles. Heavy glass bottles are not easily compacted for disposal as are other types of packaging. Also, when carelessly thrown away, they create a litter problem and a danger from broken glass. Solving this disposal problem is the industry's responsibility.

67-1204

Federal bureau in operation cleanup. Refuse Removal Journal, 10(10):14, Oct. 1967.

A trial program of the Federal Bureau of Land Management has cut littering by one-third, from 80 percent to 60 percent, in portions of Arizona's 13 million public acres. Now in its third year, 'operation cleanup' provides mobile welcome stations on key access roads, and passes out plastic litterbags and reminder cards. Special certificates of thanks are awarded to campers leaving their camp sites clean.

67-1205

48 billion cans, 25 billion bottles, jars, 65 billion caps, crowns. Metals/Materials Today, 40(8):1, Aug. 1967.

Excerpts from a paper given by William F. May, of the American Can Co., to the 36th National Packaging Conference emphasize the amount of refuse and litter produced each year in the United States and the cost of litter removal. In the United States, the disposal load involves 48 billion cans (over 250 per person), 25 billion bottles and jars (135 per person), 65 billion metal and plastic caps and crowns (338 per person), plus billions of miscellaneous packages. Litter from a composite mile of highway in Michigan, Texas, Florida, Maine, and Washington consisted of 2,665 pieces of litter, everything from cigarette packs and gum wrappers to beer cans, bottles, and even pajamas which occupied 3 cu yd of loose measure. The litter was chiefly paper packages, cans, and bottles, in that order. The cost of cleaning the road with three pickups a year was $2,500 annually and each item cost $0.32 to be picked up.

67-1206

KAB invites entries for 1967 awards program. APWA Reporter, 34(6):30, June 1967.

Competition for the Keep America Beautiful Awards in the fall of 1967 is announced. To qualify, city, county, State or youth groups with litter-prevention programs must involve citizen action and the cooperation of government officials or agencies, with the objective of improving the cleanliness and appearance of their locality. In the youth category, the project must be carried out by representatives of at least three different youth organizations working together to improve the appearance of their area by preventing litter.

67-1207

Litterbugs: are they getting the word? American City, 82(7):13, July 1967.

Keep America Beautiful, Inc., which established an index (first year = 100) in 1964, recomputes it annually by dividing the yearly cost of clearing the litter from State highways by the number of vehicle miles traveled on them and comparing the result with the 1964 value. There was an increase in the amount of littering in 1966, but the rate of increase was less than half that of 1965. The 1966 National Litter Index measured 106.8, a rise of 1.9 percent over the 1965 value of 104.8. The fifty States reported that the cost of removing litter from their primary highways in 1966 was $23,187,476. Total vehicle miles traveled on the primary highways was 332 billion. The cost of litter removal decreased in a number of States. Wisconsin, which reported reduced costs for the second year in a row, credits the effectiveness of its anti-litter program to increasing publicity and public support for anti-litter and beautification campaigns.

67-1208

May, W. F. The growing problems of convenience packaging: litter and pollution. American Glass Review, 87(13):11-12, June 1967.

Excerpts from a talk given at the National Packaging Conference are presented. Package manufacturers and consumers are asked to do something to minimize litter and pollution resulting from disposal of package wrapping. Further technological application is suggested as one possible solution. Another may be found in the fact that tin plate cans will rust and disintegrate in time, but glass, plastics and aluminum are more durable and cannot be completely consumed by incinerators.

67-1209

The nursery knight. Public Cleansing, 57(5):253, May 1967.

The Nursery Knight, reproduced in the article, is a poster used by the Ministry of Housing and Local Government anti-litter campaign. This lively figure, in eye-catching color, attracts children and adults, and offers a simple reminder.

67-1210

Spunky animals lead war on litter bugs. Refuse Removal Journal, 10(1):24, Jan. 1967.

There has been a change from soft sell to hard sell to keep the city clean. New York City changed fines from $25 to $100 for littering. The humanization of animal mascots and symbols in the anti-litter battle became popular because humans seem more inclined to take advice from animals and cartoon characters than important public officials. The trend began with Smokey the Bear. 'Gertie Glitter,' a hound, barks on signs in Connecticut. 'Tidy Coon' carries a trash pickup stick on signs in Maine. 'Sweepy the Squirrel' swings a broom at litterbugs in Maryland. 'Pelican Pete' stuffs its salvaging under-bill in California. 'Phil D. Basket' actually speaks from litter baskets calling 'a cleaner New York is up to you.'

67-1211

Sure cure for litterbugs. Refuse Removal Journal, 10(1):38, Jan. 1967.

A Brunswick, Maine, judge ordered a man who threw a paper cup onto an Interstate highway to 'pick up all beer cans and rubbish for a distance of 1 mile on both sides.'

67-1212

To de-litter a state fair. American City, 82(5):46, May 1967.

The problem of picking up litter from the Ohio State Fair, which attracts 1,500,000 people, was solved by the use of litter vacuum sweepers, which have the capacity to gather up 12 bushels of paper cups, candy and cigarette wrappers, throw-away cans, and other debris. Heavy-duty street sweepers were used for the large areas and five American Lincoln Air-sweep vacuums for the sidewalks and small areas.

67-1213

Two hundred square miles of litter. Public Cleansing, 57(11):605-608, Nov. 1967.

The problem of litter in rural areas is discussed. The litter created on highways through the use of official and unofficial picnic and rest areas, and automobile accidents, are described. The unsatisfactory performance of mechanical sweepers, farm litter, inefficient individual household refuse collection, and careless householders add to the problem. It is concluded that considerable expense, more publicity and education, and more routine enforcement are necessary, if amenities are to be preserved and the countryside kept respectably tidy.

67-1214

Weaver, L. Refuse and litter control in recreation areas. Public Works, 98(4):126-128, 160, Apr. 1967.

Refuse control in public recreation areas involves problems of not dispoiling the natural scene by man-made structures, educating visitors to use containers, and educating 'scavengers' to leave refuse in them. The best containers are of heavy-duty galvanized iron with recessed bottoms. Because of washing infeasibility, the waste residue becomes a fly-breeding medium. Therefore, plastic liners are used which are more sanitary and speed up collection pickup time. However, in rainy weather the liners may fill with a messy brew causing them to rupture or they may tear. To prevent animal entry, some containers are off-ground on a concrete slab. Refuse collection should be daily for large food service establishments, twice weekly for residential areas, and daily to weekly, as necessary, for picnic areas and camp grounds. The collection trucks should have heavy water-tight bodies and metal or canvas covers with loading height less than 60 in. The two principal disposing methods are sanitary landfilling and incineration. Landfilling is more economical but some landfills become habitats for disease vectors. There may also be the problem of bad ground or bears digging up the buried material. Incineration can reduce refuse 75 to 85 percent by volume. Some garbage is reclaimed, heated, and fed to hogs.

MANAGEMENT

67-1215

AIDIS to study creation of solid waste institute. APWA Reporter, 34(3):4, Mar. 1967.

At a recent meeting of the Tenth Congress of the Inter-American Sanitary Engineering Association (AIDIS), a resolution was adopted to approve the idea of creating a Solid Wastes Institute within the AIDIS, to entrust the matter of drafting the proposal to the Argentine Section, and to submit the proposal for approval by the Eleventh AIDIS Congress in 1968.

67-1216

Alexander, T. 'Where will we put all that garbage?' Fortune, 148-151, 189-194, Oct. 1967.

The regional or systems approach to waste disposal seems to be part of the answer to the dilemma facing many U.S. cities today. Every American generates some 6 to 8 lb of waste products a day, with this figure expected to double in twenty years. Although some cities are now spending $3 billion annually to remove solid wastes, most of them are running out of ways to get rid of the paper, grass clippings, cans, bottles, old autos, etc., that accumulate daily. This dilemma was only recently discovered, and the Solid Waste Disposal Act of 1965 was quickly passed in order to spur scientists on in an effort to find solutions. Hopefully, these solutions would involve making the wastes serve a useful purpose; however, the unknown factor is how to go about doing this without causing even more pollution. Sanitary landfills and incinerators take care of a great deal of the solid wastes, but do not necessarily make them useful again or prevent pollution. Waste management experts agree that, even on a regional basis, the major cost of any waste disposal scheme will be collection and transportation. Several plans have been submitted to cut costs, such as: railway transportation of waste products to abandoned strip mines, etc., pneumatic tubes running from apartment complexes to distant incinerators, and refuse pipelines, which would pump waste away from cities to marginal agricultural areas. Technology alone cannot handle the waste disposal problem, nor can nature itself; new patterns of cooperation between Federal, State, municipal and county agencies will have to develop.

67-1217

Arora, S. R., and W. R. Bunker. Examining costs in solid waste disposal. Public Works, 98(10):134-136, Oct. 1967.

A simple mathematical model is presented for quantifying the cost of waste collection and hauling. This model can be useful in studying the following aspects: area density of population; organization of crews; truck capacities; traffic conditions; distance between collection areas and disposal sites; and different collection policies. For illustrative purposes, two hypothetical systems are evaluated using this model.

67-1218

Betz, J. M. Application of electronic data processing and operations research techniques. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. D-1.

A management information system has been designed for the several levels of supervision involved in refuse collection and disposal for the City of Los Angeles. Most of the information will be fed in, processed, and reported in less than a 12-hr turnaround time. Linear programming of the 'transportation problem' for optimum distribution of refuse to alternate disposal sites has been investigated. One surprising difficulty has been that with a model which approaches the real situation, the problem begins to exceed the capacity of even large computers. Queuing theory has been successfully applied to yield insights into both routine waiting line situations and other areas not so obviously related to queuing. Monte Carlo simulations have been useful in explaining existing situations and evaluating the effects of proposed changes in collection procedures.

67-1219

Black, R. J., and L. Weaver. Action on the solid wastes problem. Journal of the Sanitary Engineering Division, Proceedings, American Society of Civil Engineers, 93(SA6):91-96, Dec. 1967.

The first substantial Federal commitment to attack the problem of pollution from solid wastes was made when the Solid

Waste Disposal Act was adopted in October 1965. Since that time, an impressive record of action has been compiled. The action on solid wastes is taking place in five main areas: (1) In research, 42 research projects have been undertaken with the full support of Public Health Service grants; in addition, the PHS Solid Wastes Program has begun to develop its own research capabilities. (2) Grants have been awarded to 8 universities to strengthen the solid waste training of graduate students in engineering, science and economics; and to alleviate critical shortages of personnel qualified to cope with the technical complexities of waste management. (3) 50 projects at local or State levels have begun either studies and investigations of improved approaches to solid waste management, or demonstrations of new and improved technology. (4) In the development of State programs, governors of 49 States have designated a specific agency responsible for solid waste planning. (5) Engineers and scientists of the National Center for Urban and Industrial Health are developing technical assistance capabilities as provided for by the Act in both public and private agencies. Members of the SWP staff work on such tasks as the development of disposal performance criteria. Several promising demonstration projects are outlined. It is stressed that the solid wastes problem is a health problem, which needs research, penetrating engineering analysis, and perceptive engineering innovation. (This article also appeared in Journal of Environmental Health, Vol. 30, No. 3, pp. 263-266, November-December, 1967.)

67-1220

Black, R. J. Government calls for contractor know-how. Refuse Removal Journal, 10(7):8-10, 34-35, July 1967.

Progress in solid wastes disposal administration since the Solid Wastes Disposal Act of 1965 is discussed by a representative of the Office of Solid Wastes. Enough progress has occurred in the first 18 months after the Act to indicate that soon a new era in solid wastes management will appear. This new era requires dedicated cooperation between government at all levels and industry. A first step has been taken in the meeting of the Solid Wastes Program in Washington, which resulted in the establishment of a Government-Industry Liaison Council. Although the Solid Waste Disposal Act limits grants to public agencies and nonprofit organizations, the door to Program participation by profit-making private enterprise remains open.

67-1221

Black, R. J. Private contractor opportunities in the solid wastes program. Journal of Environmental Health, 30(2):181-185, Sept.-Oct. 1967.

The opportunities and responsibilities of refuse equipment manufacturers in the solid wastes program are outlined. The major activities of the solid wastes disposal program, authorized in Oct. 1965 by the Solid Waste Disposal Act and administered by the National Center for Urban and Industrial Health, will result in substantial benefit to the refuse equipment manufacturing industry. Examples are: technical service activities; training activities; statewide surveys of solid waste disposal needs, and the development of State plans to meet those needs; projects for the conduction of research and the demonstration of new and improved solid wastes technology; and plans to design new area-wide waste management systems. Program grants covering up to two-thirds of the cost have been awarded to 32 demonstration or study and investigation projects. Profit-making private enterprise can participate in the program by contract with the solid wastes program or with one of its grantees, and many grant-supported projects now under way are aimed at finding solutions to problems directly concerning the industry. Examples are: improved incineration with heat recovery; improved sanitary landfills; and conversion of solid wastes into carbon, chemicals, and other marketable products.

67-1222

Bowen, C. H., and H. Van Hille. Engineering report on solid waste disposal Wayne County, Michigan. Muskegon, Mich., Consoer, Townsend, & Associates, 1967. 11 p.

A rapidly deteriorating refuse disposal situation resulted in the decision to develop a plan for Wayne County as an entity rather than wait for the preferred regional plan which had met with opposition. Terminology, history, and various solutions are discussed. Statements of present and future requirements, including population estimates and refuse quantities experienced and expected, are shown. Incineration was chosen as the best alternative and plans were developed to conform as closely as possible to the regional plan proposals which might be adopted by the neighboring communities at some future time. The locations, basic design considerations, and capital, operating, and maintenance costs of the incinerators are described. Recommendations for transfer stations at a less populous location were made. Transport of the ash residue to two possible sanitary landfill locations was considered and equipment and site operation options detailed. A financial statement and construction schedule are given in full; and financing, including bond issues and cost per ton charges expected, is shown. Numerous tables and graphs as well as maps of the area contain the data used for the recommendations.

67-1223
Braun, P. A regional refuse-disposal solution. American City, 82(12):96-97, Dec. 1967.

Sparta Township in New Jersey has experienced population growth, with the accompanying need to find a long-range solution to the disposal of solid wastes, but neither the county nor any other regional agency had made or planned to make feasibility studies or master plans for solid-waste disposal. The sanitary landfill method was thought the most desirable due to its relative economy, the availability of land, and the fact that not very large numbers of people required service. A 100-acre site was thus located and a detailed engineering feasibility study made. The most important finding was that the proposed site was suitable and had sufficient area and cover material to provide for the needs of 17 of the 24 municipalities in Sussex or Morris Counties. These 17 communities were specified because they are all within a 10 mile radius of Sparta Township. The site was therefore purchased and work begun in the spring of 1967 to prepare it for use. This site is estimated to satisfy the refuse-disposal need of almost the entire Sussex County for 25 years.

67-1224
Bremser, L. W. Regional solid wastes management. Journal of the Sanitary Engineering Division, Proceedings, American Society of Civil Engineers, 93:45-49, Oct. 1967.

The failure to apply sound management to the disposal of solid wastes has resulted in uneconomically small operations which were poorly planned, inadequately supervised unsanitary, and generally unsatisfactory. The purpose of solid waste management is the handling and disposal of solid wastes at a reasonable cost with the minimum adverse effect on the environment. The production of refuse, which is increasing with planned obsolescence and throwaway packaging, must be reduced at the source, either by public education or legislative action. The transfer of pollution to air and water from the solid waste is also a matter of concern. The basis for the solution to the management problems is that of the regional approach, and the article is concerned with the logical approach to the development of a regional plan which will cope with the multijurisdictional problems. Political barriers pose problems for a logical organization of solid waste disposal. The first act of a regional authority should be to define the problem and outline a sound long-range program. The scope of the regional management depends on local conditions, with the county as the logical unit of government, although in some cases, such as Washington, D.C., the authority includes the District of Columbia, three cities, four counties in Virginia, and three counties in Maryland. In densely populated urban areas, regional management is needed to provide land, facilities, and a competent staff to provide for proper disposal of solid wastes.

67-1225
Clark, R. L. Administrative problems in the regional approach to solid waste management. In L. Weaver, ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.139-148.

The municipality of Metropolitan Toronto, constituted in 1953, is described. Certain municipal activities were under this regional authority and some remained local, among them waste disposal. Events and conditions leading up to regionalization in 1967 are described. A study by consulting engineers recommended a combination of incineration and landfill methods and a budget has been established to fulfill the plan. An amendment to the Public Health Act prohibits new landfills until studies show no groundwater pollution, and until engineering plans are submitted to and approved by the Department of Public Health. The amendment also provides for inspection of active sites for correction of unsatisfactory conditions at the operator's expense. Sections of the Municipality of Metropolitan Toronto Act pertinent to waste disposal are included.

67-1226
Colorado Legislative Council. Solid waste disposal; report to the Colorado General Assembly. Research Publication No. 129. Denver, Dec. 1967. 46 p.

The report of a committee on solid waste disposal appointed by the Legislative Council of the Colorado General Assembly is presented. Findings on automobile body disposal, junkyard control in Colorado, and refuse disposal (both in general and in Colorado specifically) are included. The committee proposes that Congress be requested to amend the Highway Beautification Act to permit the use of Federal funds for the actual removal and disposal of solid wastes in junkyards adjacent to interstate and primary highways. Appendix A is a copy of this proposal to be submitted to Congress. The need for a regional approach in Colorado is not pressing now, but the committee recommends that the General Assembly consider the inclusion of solid waste disposal in any proposal to amend the State constitution to permit regional or metropolitan governmental services. Appendix B contains sections of the Highway Beautification Act pertinent to the control of junkyards.

67-1227
Computer to aid disposal planning. Refuse Removal Journal, 10(8):34, Aug. 1967.

A computer will be used to select the best solid waste management system in Raleigh, North Carolina. This is the first operational application of a highly specialized computer technology developed at Northwestern University under Solid Wastes Program sponsorship. Costs, waste haulage distances, etc., can be analyzed to decide among alternative landfill sites. This model-computer system may also be used to help solve disposal problems at the North Carolina Research Triangle in Chapel Hill.

67-1228
Denver to finance disposal research. Refuse Removal Journal, 10(10):20, Oct. 1967.

Since efforts to interest suburban officials in financing a refuse disposal study failed, the City of Denver decided to pay for the study itself. At least two studies have been made of the city's problem, by the State Health Department and the Inter-County Regional Planning Commission, without results. Within the last year, Denver has received several plans. They include composting and continued use of land, distant fill via transfer stations and large vehicles, incineration, and disposal by railroad. Because existing dumps are filling up, Denver must decide within the next 2 years which refuse disposal method it should employ.

67-1229
Dudley, R. H., and K. K. Hekimian. A systems approach to solid waste management (with application to Valencia, California). In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. A-11.

A systems approach to solid waste management has been formulated. Using this approach, those involved in the decision-making process established relevant criteria and constraints, developed state-of-the-art alternative systems, postulated advanced alternative systems, and performed comparisons--quantitative insofar as possible--of the cost, benefits, risks, and timing associated with each alternative policy or strategy for achieving the objectives which had been set forth. As an initial step in the application of this approach, a feasibility study has been made to select preferred alternative solid waste management systems specifically tailored to the time-phased needs of Valencia, California, a new town. The study utilizes the concepts of value theory, the development of a three-dimensional scoring technique, and the application of a quantitative cost/benefit model, in the context of the engineering design decision situation. The resulting methodology was applied in the selection of a list of 15 candidate systems of varying levels of risk to this developing city in Los Angeles County. A flow chart of various types of solid wastes systems is included as well as a three dimensional scoring scheme.

67-1230

Eldredge, R. W. A monumental problem. Ohio's Health, 19(12):10, Dec. 1967.

The Solid Waste Disposal Act of 1965 directs the U.S. Department of Interior to help solve solid waste problems resulting from extracting, processing, or using minerals or fossil fuels; remaining responsibilities are assigned to the Department of Health, Education, and Welfare. Functions of the latter are being discharged in Cincinnati, Ohio. The Act requires the Federal Government to play a cooperative role, assisting outside agencies technically and financially. The Federal Government has no control over collection, disposal, or adoption of improved equipment and methods. Program functions include: investigations of characteristics of solid wastes; research on public health aspects of disposal; demonstration projects of techniques for disposal conversion, conservation, and salvaging; surveys and planning toward State and interstate programs; disposal design and analysis using systems management principles; and graduate-level management courses. The nations's per capita refuse production has risen from 2.75 lb per day to 4.75 lb per day from 1920 to 1965, and increases 4 percent per year. Annual collection and disposal costs exceed 3 million dollars, yet 50 percent of all cities with more than 2,800 population have unsatisfactory operations. Present methods generally consist of inexpensive gathering and dumping at distant locations. Incineration, composting, and grinding processes have developed due to a shortage of such sites, though the latter method continues to contribute to air and water pollution and breeding of disease carriers. Yearly disposal of 800 million lb of wastes is perplexing especially since much is almost indestructible. Creative thinking supported by public interest can meet the challenge.

67-1231

Environmental Engineering Intersociety Board, and the American Association of Professors in Sanitary Engineering. Report of the Second National Conference on Environmental Sanitary Engineering Graduate Education, Evanston, Ill., Aug. 27-30, 1967. 61 p.

The objectives of the Conference are best summarized by the nine study topics selected for Task Committees. The topics are: the role of the engineer in environmental engineering, scope of environmental engineering, chemistry in environmental engineering curricula, biology in environmental engineering curricula, social sciences in environmental engineering curricula, planning of environmental systems, non-engineering students in environmental engineering programs, criteria and mechanisms for accreditation of professional curricula, and graduate curricula for professional and research careers in environmental engineering. The Task Committee reports on these topics and discussion from the floor provided the material for the preparation of the final report. It is evident that environmental engineering is an interdisciplinary science based on the engineering and applied science fields for which man and his well-being are the principal focus.

67-1232

Establish industry-government group. Refuse Removal Journal, 10(6):37, June 1967.

Leo Weaver stated that the Solid Wastes Program needs industry's cooperation. An Industry-Government Solid Wastes Liaison Council was established at a recent meeting of the Board of Directors of the National Council of Refuse Disposal Trade Associations and the Public Health Service's Solid Waste Program.

67-1233
Four more states get solid wastes grants. APWA Reporter, 34(7):25, 27, July 1967.

With the recent addition of Maryland, Massachusetts, Tennessee, and Texas to the list, 25 States are now receiving grants from the Public Health Service to develop solid waste management plans. The recently awarded funds, totaling $136,656, will pay up to 50 percent of the cost of statewide surveys and planning. Leo Weaver, chief of the Solid Wastes Program pointed out that, 'A major objective of this statewide planning is to develop comprehensive solid waste management systems that are responsive to regional disposal needs...to reverse a nation-wide tendency to leave responsibility for waste disposal with communities unable, usually because they are too small, to handle the job except in ways which endanger health and cause scenic blight.'

67-1234
FMC Corporation. Solid waste disposal demonstration project, 1966 systems analysis progress report. Santa Clara, Calif., Feb. 15, 1967. 47 p.

The solid waste disposal systems analysis for the City of San Jose and the County of Santa Clara involves three major tasks: a solid waste system survey, a resource recovery processes survey, and analysis and evaluation. The solid waste system survey has been divided into four sub-surveys which are being conducted concurrently: household and commercial, agricultural, industrial, and sewage sludge. Existing solid waste statistics and data recorded by the City of San Jose, Santa Clara County, and the State were reviewed. In general, detailed data for quantity, composition, and variability of solid waste was found not be available with the exception of sewage sludge. The Household and Commercial Pilot and Main Survey plans were formulated and the pilot survey commences early in 1967. The Agricultural Survey plans were formulated and information is being gathered for data processing. The Industrial Waste Survey is in process and data are being received from the industries contacted and being processed. All sewage treatment plant managers in the County were interviewed and the historical quantitative data available are in the process of being analyzed. A survey of 1967 sewage sludge generation has commenced. A number of supplemental appendices follow.

67-1235
FMC Corporation. Household and commercial refuse. In Solid waste disposal demonstration project, 1966 systems analysis progress report. Santa Clara, Calif., Feb. 15, 1967. p.7-17.

The literature search which provided some of the background for the survey indicated that the volume of household refuse has changed significantly in the last few years, and the volume and mix of household refuse varies with climate, season, and socio-economic level. One method considered in the identification of refuse, the Collectors' Route Survey, would entail sorting and measuring full truckloads of compacted refuse from collector routes. Two other methods, the Container Pickup Survey and the Route Sample Survey are also described. Refuse of each category will be sorted into 2- to 3-yd bins or containers of smaller levels to obtain accurate volume measurements; the weight of each container will also be known. The categories into which the household and/or commercial refuse will be sorted are: vegetable wastes; animal wastes; glass and ceramics; wood; paper board; plastics; leather; textiles; oils, paints, and fats; metals; aluminum; paper; rubber; miscellaneous; and residue. If available space permits, an area will be provided at the sorting site for the equipment and personnel necessary to prepare refuse for testing the combustion characteristics of the samples. During and following the 6-day pilot survey, sorting and recording techniques, sorting equipment, and personnel requirements will be evaluated and modified as necessary for the main survey. During the main survey, the quantity and mix of household and commercial refuse, taken to disposal sites by the residents and owners themselves, gardeners, and part-time collectors, will be determined.

67-1236
FMC Corporation. Agricultural solid wastes; industrial solid wastes; sewage sludge. In Solid waste disposal

demonstration project, 1966 systems analysis progress report. Santa Clara, Calif., Feb. 15, 1967. p.18-34.

An information search revealed that quantitative data on sources of agricultural solid waste are available, and some estimates of animal waste quantity and disposal have been obtained. For the study, the agricultural waste sources are defined by these categories: animal wastes by type, orchard wastes by type, row crops by type, and others by type. Sample units will be selected from each farm classification to determine typical waste quantities and disposal methods. An up-to-date listing of industrial firms for the County of Santa Clara was developed and coded according to its Standard Industrial Code classification. The solid waste data will be collected by two independent methods: mail-out questionnaires to firms with less than 100 employees and personal interviews with large firms by a staff survey team. The following information will be gathered: types of routes; number of routes; names of firms collected from, by route; route schedules; and disposal sites. Existing disposal sites can be readily assessed as to present or future capacities based on data obtained in the main survey. Three types of solid wastes are produced in Santa Clara plants: digested sludge, grit, and screenings. Digested sludge presents, by volume, the greatest disposal problem. The results of a sewage sludge pilot study in the San Jose and Santa Clara Water Pollution Control Plant are given. The objectives of the main survey are to more accurately determine the volume, variability, and characteristics of the treatment plant solids disposal problem, and to establish when projected changes will take place.

67-1237

FMC Corporation. Survey of resource recovery supplemental processes; analysis and evaluation. In Solid waste disposal demonstration project, 1966 systems analysis progress report. Santa Clara, Calif., Feb. 15, 1967. p.37-47.

Cursory review has been made of compost processes and carbonizing operations. Plans call for obtaining the following information as a basis for selecting one existing process judged the most appropriate for each resource which can be recovered: functional information such as operations performed, type of equipment involved, power, utilities, and space requirements; capital cost estimates, as related to capacities; and operating cost estimates as related to capacities. Information for steam generation and demolition debris reduction and disposal will be obtained later in the project. Data from the Solid Waste Systems Survey is to be in the form of solid waste quantities for each census tract identified by types of waste, source categories, collection methods, and disposal methods. Information from the Supplemental Resource Recovery Processes Survey is to be in the form of capital costs, operating costs, and functional data such as input requirements and sizing data. Existing management controls and operational responsibilities are to be superimposed as fixed constraints upon the physical and economical representation of the solid wastes disposal systems under consideration. Details of the structural application features of the simulation and projection models are covered as to: a simulation model structural plan, simulation model application, and model output.

67-1238

Gahr, W. N. Refuse and the state government. Colorado Municipalities, 43(10):250-251, Oct. 1967.

The nation generates 800 million lb of trash per day, or 4.2 lb per person per day. A 1.7 lb per capita per day increase is expected in the Denver area when backyard incineration is banned. Last June the Colorado State Health Department obtained a fifty-fifty matching grant from the Federal Government to make a State-wide survey. Guidance information in the form of a model resolution for county use and one for municipalities has been written. Provisions of Public Law 89-272 are mentioned: research grants to universities; training grants to graduate level education; demonstration grants for application of new or improved methods; grants for investigating means leading to the demonstration of improved disposal practices; and State and interstate survey and planning grants to support State efforts in developing comprehensive management plans. Federal support of up to 50 percent is available for local survey and planning projects, and up to two-thirds of total cost of demonstrations or studies and investigations.

67-1239

Gershowitz, H. The National Council: drafts municipal pacts. Refuse Removal Journal, 10(9):38, Sept. 1967.

The Industry-Government Solid Wastes Liaison Council is currently engaged in a joint effort with the Solid Wastes Program to design model municipal contracts to cover the areas of sanitary landfilling, incineration, and refuse collection. It hopes to present its first model contract, on sanitary landfills, by mid-October. This model contract will attempt to establish a long-needed, universally-acceptable definition of a sanitary landfill. Also to be included will be an extensive list of basic agreements between the municipality and the contractor in order to assure proper and continuous operation of sanitary landfills in all communities where the model contract is utilized. The stated purpose of the Liaison Council is to establish a continuing dialogue between the government and industry. Members of the industry desiring to make specific suggestions to the Model Landfill Contracts Committee can do so by writing to the National Council at 1022 15th Street N.W., Washington, D.C.

67-1240

Gershowitz, H. The National Council: 1967's accomplishments. Refuse Removal Journal, 10(12):50, Dec. 1967.

The National Council of Refuse Disposal Trade Associations reviews programs and progress made during 1967. Two main goals were established in the beginning of the year: to establish a meaningful and constructive liaison with the Federal government, and to continue to build an authoritative voice for private enterprise in the refuse industry. Progress in changing the Highway Beautification Act and working with the Federal Solid Waste Program is discussed, with mention of the redefinition of sanitary landfills to exempt them from the Highway Beautification Act. The Government-Industry Solid Waste Liaison Council met twice during 1967. This year also saw the successful Third Annual Refuse Equipment Show and Congress, held in San Francisco. In 1968, the name of the National Council will change to the National Solid Waste Management Association.

67-1241

Golueke, C. G. Comprehensive studies on waste management. Presented at Engineering Foundation Research Conference, Solid Waste Research and Development, Milwaukee, July 24-28, 1967. Conference Preprint No. A-1. 17 p.

Research objectives and plan of attack were formulated with the knowledge that there are but seven possible types of waste disposal systems for dealing with all or with selected fractions of the overall solid wastes: reduction at the source, diversion at the source, disposal to land or ocean sink, change of state, direct recycling to resource, indirect recycling to resource, and conversion. Phase I activities consisted of a literature survey and an intensive review of the amount of wastes of various categories generated in Santa Clara County, California, in 1967 and the components of each category. Phase II is now in progress. The nine participating research teams in the four major areas of planning, operations research, public health, and technology have refined their objectives, coordinated their efforts, and are engaged in definitive research on systems essential to the success of an overall wastes generation and evaluation model. A mathematical model based on the conceptual model developed in Phase I was developed. Using Santa Clara County as a laboratory in which to study wastes, four factors were explored: location of disposal sites and definition of service areas, land use and employment, solid wastes generation, and composition of solid wastes. The health implications of the various individual materials occurring in refuse were evaluated. Studies of the technology of solid wastes management covered: incineration, pyrolysis, composting, sanitary landfill, salvage, anaerobic digestion, wet oxidation and biological fractionation. (Research supported in part by Public Health Service Grant 1 R01 SW 00003-01)

67-1242

Golueke, C. G., and P. H. McGauhey. Introduction. In Comprehensive studies of solid wastes management; first annual report. Sanitary Engineering Research Laboratory Report No. 67-7. Berkeley, University of California, May 1967. p.1-14.

Members of the faculty of the College of Engineering and the School of Public Health plus other faculty members of the University of California have studied the problems of waste management in this country from a multi-disciplinary approach. As many as 14 different disciplines have been represented. Considerations of public psychology, public health, properties of synthetic materials, and reuse of waste materials enter into the study as well as the traditional approach of finding efficient disposal means. Ultimately, the volume of waste produced will have to be reduced, but at the present time, only the possible reuse of waste materials and the most efficient disposal of the remainder can be considered. The study is made from a community-wide viewpoint considering all forms of waste produced, and all forms of transportation and disposal available. The work has two phases, the first being where all participants function as a single research team to become fully acquainted with all aspects of the solid wastes problem and to collect and evaluate data on current technology and management techniques. The second phase involves definitive research on areas outlined by phase one. An organizational chart is included as well as a table summarizing the participants in the program.

67-1243

Golueke, C. G., and P. H. McGauhey. Data collection and evaluation. In Comprehensive studies of solid wastes management; first annual report. Sanitary Engineering Research Laboratory Report No. 67-7. Berkeley, University of California, May 1967. p.15-40.

To collect data on which to base definitive research was the goal of phase I of the program. This started with a literature search in which some 500 documents were collected, abstracted, and codified. Personal interviews with management and operating personnel in the field of waste management were also conducted. A study was made on the characteristics of the waste situation in California and specifically in Santa Clara County. Very little information was available due to the generally unscientific approach to waste management in the past. Detailed breakdowns into categories of glass, plastic, metals, leathers, etc., are shown in tables for both domestic waste producers and for each specific type of industry in the county. Agricultural wastes were also studied even though they do not pose an immediate problem. The manure from dairies and chicken farms is the principal agricultural waste and is currently hauled privately to nearby truck gardens. The City of Berkeley was selected as a model because a survey of its wastes made in 1952 was available. Repeating this survey showed that the major categories of waste have remained roughly in the same proportions, but the trends show that metals are decreasing and glass and plastics are increasing. Low income areas show higher percentages of rags and shoes than higher income areas where such items might be given away. From these studies, a Regional Waste Generation and Evaluation Model was developed into which the entire project activity could be fitted. Particular attention was shown to be needed in economic studies and also salvage, biological, and wet oxidation studies.

67-1244

Golueke, C. G., and P. H. McGauhey. Operations research. In Comprehensive studies of solid wastes management; first annual report. Sanitary Engineering Research Laboratory Report No. 67-7. Berkeley, University of California, May 1967. p.41-54.

The Regional Waste Generation Model developed in phase I of the program is converted into a mathematical model by which the inputs from the various research teams in several areas of definitive research could be utilized to develop the optimum decisions and operational procedures on which management depends. First, a waste profile for an arbitrary region and time period was developed. The profile, which is outlined, is the input for a Waste Collection-Treatment and Disposal Model. A megapolis area is considered with all its waste flows such as sewage lines, transfer stations, and different hauling vehicles. Of major importance is the system used to predict an optimal management system. This takes input data from land use, population, waste technology industry, and the national economy, and considers them in the framework of the regional economy to predict quantities of waste by use and location. This is then considered using the various management system alternatives and the results are optimized to produce the best management system.

67-1245

Golueke, C. G., and P. H. McGauhey. Planning and economics. In Comprehensive studies of solid wastes management; first annual report. Sanitary Engineering Research Laboratory Report No. 67-7. Berkeley, University of California, May 1967. p.55-74.

Research in the area of planning and economics must include land-use planning of the community as well as social, aesthetic, and environmental goals of the population. The economic attitudes and technological capabilities must also be considered. Moreover the types and amounts of wastes generated can be predicted on the basis of how many people use how much land for what purposes within a community. Santa Clara County was selected as a suitable laboratory area because of its urban-surburban-industrial-agricultural characteristics. Factors of location of disposal sites, land-use and employment, solid waste generation, and composition of wastes are considered in detail. The data are used to formulate a regression analysis. Tables list the disposal service areas by location and census tracts, land use proportions by census tracts, employment by disposal areas and planning areas, and the economic and operational variables involved in the county disposal sites. A summary of the linear regression results is presented along with the data used to create it.

67-1246

Golueke, C. G., and P. H. McGauhey. Summary. In Comprehensive studies of solid wastes management; first annual report. Sanitary Engineering Research Laboratory Report No. 67-7. Berkeley, University of California, May 1967. p.167-174.

This report covers the first year's activities of a comprehensive study into the field of solid waste. Such far reaching factors as the structure of modern communities and the social and aesthetic goals of man have been considered by a group of researchers that includes engineers, economists, political scientists, and public health experts. Phase I of the program included a comprehensive literature search followed by interviews with persons in the field of waste management. A model area was chosen in California and its waste flows studied in depth. Phase II of the program has begun and involves definitive research into specific areas of waste handling. These projects include: operations research for producing a mathematical model of the management needs of the model community; public health; and a technology study which considers the existing methods of waste management. This last group has considered the existing processes of incineration, composting, landfill, and salvage; the sewage procedure of anaerobic digestion; and the new ideas of wet oxidation and biological fermentation.

67-1247

Hannavy, A. Can engineering cope with the debris of affluence? Product Engineering, 38(21):36-44, Oct. 9, 1967.

The increasing problem resulting from the necessity of disposing of 152 million tons of solid wastes a year (and more in years to come), at a time when the available land for disposal is decreasing, may be met by the application of systems analysis. Systems analysis is being used to determine the best solution for each city's waste problems and to seek engineering solutions which will provide the best opportunity for the reuse of wastes. Because of the possible reluctance of the public to accept the ideal engineering solution, the input for the systems analysis model includes such considerations as public health, land-use patterns, technology, economic costs and benefits, and public acceptance. A chart is given which plots the input and output considerations used by the systems engineer in solving the problem of the disposal of solid waste garbage, rubbish, and bulky junk. A drawing is given of a Japanese technique which compresses garbage into rocks under 2,980 psi with a reduction in volume of 75 percent. The garbage rocks are coated with iron so that they can be welded for use in foundations and retaining walls. The odor problem is eliminated by the compression, it is claimed. A 'Carbecue' plant developed in Japan is also shown which cooks out the nonmetallic, melts out the nonferrous metals and bales the scrap left from cars. Pictures are shown of open dump burning and auto junkyards. The conventional methods of disposal are reviewed.

67-1248

Hawkins, M. B. Methods for the prediction of waste characteristics. Presented at Third Annual National Refuse Equipment Show and Congress, San Francisco, June 4, 1967. 19 p. (Unpublished manuscript, Burlingame, Calif., URS Corporation.)

The prediction method was used as an approach based on the premise that all things that enter our society ultimately become waste; a study of the materials and commodities that enter a community will provide information on the waste characteristics; a study of predictions of changes in the character of materials, commodities, industrial processes, and communities will provide data on waste characteristics of the future. Numerous charts on consumption, processing, generation, population growth, world growth, products, and solid waste composition are furnished. The development of an overall waste prediction model for a given community involves: identifying all consumption, processing and generating activities; establishing the pertinent input-output characteristics and estimating quantities per day or month; determining the size and location of activities; locating and validating predictions of land use changes; ascertaining the materials and commodities that enter the community; and assembling data on commodity composition.

67-1249

Hessing, F. J. Goals of the regional plan for the Ruhr Valley. Wasser und Abwasser, 108(10):254-257, Mar. 10, 1967.

The Ruhr Valley comprises an area of 4,590 sq km with 5.7 million people. Under a new regional plan, which has been delivered for approval to the State government, 214 municipalities will cooperate. According to this plan, certain tasks will be handled regionally rather than by individual towns from common traffic regulation, water protection, farming, and housing, to solid waste disposal. The last requires especially close cooperation between the towns because available disposal sites have become scarce. Some towns do not have any sites left at all. Methods for reducing the volume of the waste prior to dumping must be promoted. Common incinerator plants and composting plants shall be erected. (Text-German)

67-1250

Hume, N. Management information system studied for Los Angeles. Refuse Removal Journal, 10(11):39, 44, 46, Nov. 1967.

The Refuse Collection and Disposal Division of the Los Angeles Bureau of Sanitation serves the third largest city in America. The division hauls over 1,130,000 tons of rubbish annually, nearly all of it residential, and employs about 1,350 people, of whom 950 are engaged in direct collection activities, 24 are concerned with landfill operations, and the balance of almost 400 are occupied in equipment maintenance, supervisory, clerical, and administrative positions. The operation of this collection program in accordance with integrated systems concepts is discussed. The formation of a research and planning division in 1963 has allowed the Bureau to devote increased attention to systems concepts. The design and implementation of an automated information system, based around IBM 1050 equipment with telephone tielines, will improve uniformity, speed, and accuracy of the information required for decision-making at all levels of management.

67-1251

Hume, N. Sanitation management information system. In Proceedings; Second Annual Meeting, Institute for Solid Wastes, Boston, Oct. 3-5, 1967. Chicago, American Public Works Association. p.5-9.

The design of an information system responsive to the needs of refuse collection and disposal in Los Angeles is described. Los Angeles has a collection fleet of 500 trucks which collect 4,000 tons of refuse per day. The refuse is disposed of at seven sanitary landfills and 1,500 employees are required for the operation and maintenance of all equipment and facilities. Refuse collection activities were organized on a district basis. Interviews were held with supervisory personnel to determine what decisions were made. Exception reporting, which involves the presentation of only that information which has been predetermined to indicate abnormalities or conditions requiring decisions, was found to be a useful technique. Two basic documents were developed: a summary of decision processes for the various levels of supervision, and decision tables for identifying the relationship between the decisions made and information utilized. A systems engineering consulting firm was contracted to implement the specified information system. The system chosen centered around IBM 1050 equipment which allows the transmission of data at a high rate between remote stations. Programs for the IBM 360 computer perform the required analyses on the data.

67-1252

Korbitz, W. E. Looking to the future with a regional refuse disposal plan. Public Works, 98(6):120-121, June 1967.

Omaha, Nebraska, has conducted a regional refuse disposal study. Refuse is collected weekly by National Disposal Service under contract with the city which limits it to 100 gal of mixed refuse per residence. Excess refuse is collected by 300 private scavengers. In 1955 the city constructed an incinerator and established a landfill. In 1964 the city objected to establishing more landfills, therefore a site was established in Iowa. A study is undertaken with the following objectives: plans for indefinite future, most economical methods, most economical haul distance, standardization of collection, enforcement of disposal regulations, and minimization of air and water pollution. The study will require: population and refuse quantities; determination of economical location; zoning regulations; determination of location for transfer stations, compost plants, incinerators and sanitary landfills; and methods of disposal for automobile bodies and building debris.

67-1253

Kruty, S., and E. A. Tehle. Systematic planning developed over-all waste disposal program. Plant Engineering, 21(4):124-126, Apr. 1967.

The over-all examination of Dearborn Chemical plant operations before setting up a new disposal system is reviewed. The first step recommended is to classify waste in like categories, for example: combustible, petroleum-based, noncombustible, and chemicals dissolved, suspended, or emulsified in water. The combustibles are incinerated; the noncombustibles and petroleum-based wastes are hauled away. Water wastes are treated to restore neutral pH, clarify effluents, and settle sludge for removal by scavenger service. Cost is reduced by using the same chemicals for water treatment as those used in the manufacturing of product lines. Such dual use of hydrochloric acid, sodium sulfide, and sodium hydroxide is discussed. A schematic drawing and detailed description of the liquid waste disposal system are included, mentioning pH, alkalinity, flocculation, and the retaining lagoon.

67-1254

Leo Weaver appointed. American City, 82(4):50, Apr. 1967.

Leo Weaver succeeds Wesley E. Gilbertson as chief of the Solid Wastes Program in the Public Health Service. He will direct Federal participation in cooperative efforts with local and State governments and private organizations.

67-1255

Leo Weaver named head of solid waste program. APWA Reporter, 34(4):6, Apr. 1967.

Leo Weaver has been named chief of the Solid Wastes Program in the Public Health Service's National Center for Urban and Industrial Health. He will direct Federal participation in cooperative efforts with local and State governments and private organizations to solve problems created by unsanitary and landscape-disfiguring solid wastes disposal practices. Mr. Weaver was commissioned in the Public Health Service after his graduation from New York University, College of Engineering in 1948. His first major assignment was for North Dakota's Department of Health. In 1957 he became chief of the Public Health Service refuse sanitation program. Mr. Weaver was sanitary engineer director at the Robert Taft Sanitary Engineering Center in Cincinnati, Ohio.

67-1256
Maier, P. P., and P. A. Rogers. The California integrated solid waste management project. California Vector Views, 14(10):60-68, Oct. 1967.

The California Integrated Solid Waste Management Project, initiated in July 1966, is to be an intensive study of solid waste management in an area of approximately 1,200 sq miles surrounding the city of Fresno, California. The stated objectives of this study are to investigate, plan, and design a regional solid waste management system that will handle urban, industrial, and agricultural wastes. A portion of the Fresno area was selected because this area has problems that are representative of many other locations, in and out of the state. A systems approach is being used in the analysis and design of the proposed regional plan; this part of the project will be handled by Aerojet-General Corporation. Much effort in the area of public education has gone into the production of a documentary film, 'It's a Good Feeling', designed to motivate positive public response toward resolving community solid waste problems. Development of standards, a public education program, and the final report are expected to be concluded in June, 1968.

67-1257
McGauhey, P.H. Living with our wastes. In J. E. Flack, and M. C. Shipley, eds. Proceedings; Ninth Western Resources Conference, Man and the Quality of His Environment, University of Colorado, Boulder, July 5, 1967. University of Colorado Press, 1968. p.17-22.

Use of food and fiber, and of commercial products of industry, produces municipal refuse abounding in garbage, plastics, glass, paper, old furniture and appliances, gadgets of all descriptions, junk and old automobiles, sewage sludge, and so on. Housing, transportation, and construction produces demolition debris involving wood, brick, metals, concrete, earth, stone, dust, silt, etc. The distressing fact concerning this waste production by man's activities is that into the air, the water, or the land go gaseous, liquid, or solid materials representing the entire gamut of disposal possibilities. But the air, the water, and the land constitute the environment of man from which he cannot disassociate himself. Thus pollution of the environment is an inescapable by-product of industrial man. This pollution may affect the quality of the environment in many ways, all of which are degrading rather than upgrading. From an engineering viewpoint, the problem of wastes management becomes one of finding the optimum combination of discharges to the air, water, and land resources which man will accept from the viewpoint of environmental quality and, finding more ways to reduce pollutants to an absolute minimum. Both of these problems are closely related to economic concepts of man at any point in time. If man is to control the quality of his environment in America and achieve the objectives of pure air, clean water, and unpolluted land he is going to have to accept regional systems of unprecedented jurisdictional nature, revise upward his concept of economic feasibility, and above all surrender much of our national heritage of waste.

67-1258
Mields, H. Public administration aspects of area-wide planning. In L. Weaver, ed. Proceedings; the Surgeon General's conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.149-154.

The pressing need for a regional authority to deal with waste disposal in the Washington area is discussed. The nature of the disposal problem is briefly described. Program goals are enumerated. Work could begin now under the auspices of the Washington Metropolitan Council of Governments. Goals of the proposed regional authority are discussed.

67-1259
Mitchell, R. E., F. R. Bowerman, and T. E. Walsh. A systemized approach to urban-rural solid waste management. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. A-3.

Aerojet-General has undertaken to determine, by a systems study, an optimum solution to a specific region's (California) problems and develop a technology for study of the region that may be applied in other similar regions. The plan of operations is outlined. The essential elements of the work are: development of a method of evaluating a solid waste management system and comparing it to alternative systems; and assessment of a region's present system and measuring the magnitude of the present and near future problem. A measure by which alternative systems can be evaluated against a common criterion must be developed. Conceptual design, performance, and cost of various systems must be evaluated. Data and methods will be developed on: identification of solid wastes and groups affected by the problems, identification of conditions under which the system must operate, and provision of itemized and charted data on the performance and costs of each system considered, among others.

67-1260

More states join regional approach to solid waste problem. American City, 82(6):44, June 1967.

The addition of four more States--Maryland, Massachusetts, Tennessee, and Texas--brings to 25 the number of States developing solid waste management plans. Participants in a national program for planning attacks on solid waste pollution become eligible for Federal grants totalling up to 50 percent of the cost of statewide surveys that are needed to eliminate solid waste disposal practices that create health hazards and destroy natural beauty. Leo Weaver, chief of the Solid Wastes Program in the Public Health Services National Center for Urban and Industrial Health stated that 'a major objective for this statewide planning is to develop comprehensive solid waste management systems that are responsive to regional disposal needs. We are seeking to reverse a nationwide tendency to leave responsibility for waste disposal with communities unable, usually because they are too small, to handle the job except in ways that endanger health and cause blight.'

67-1261

Muhich, A. J. A basic data system for solid waste. In Proceedings; Solid Waste in Urban Environments--a Community Action Seminar, Houston, Mar. 9, 1967. University of Houston. p.22-26.

Due to the paucity and general unreliability of existing information of solid waste conditions and practices, the major effort during the first half of the grant period under the Solid Waste Disposal Act will be implementation of statewide solid waste surveys. From the State viewpoint, the survey will provide the quantitative information required for the development of State legislation; the information will be used as the basis for development of design and performance criteria and for the development of effective public information programs. Uniform and reliable data are also necessary to provide guidance to the Federal Solid Wastes Program in administering funds for demonstration projects, training and research grants, and contracts. The data listings and reporting forms for the National Survey were developed and tested in five States (California, Michigan, Pennsylvania, New York, and Virginia). The forms were designed to gather data on a community wide basis focusing on community description, storage, collection, disposal, and budget and fiscal matters. The land disposal surveys will include any site on which there is dumping of solid wastes by public and/or private collectors. The Facility Investigation Form contains a separate section on the design features and operational characteristics of incinerators. The proposed survey will cover approximately 75 percent of the United States population. A minimum population size limitation of 5,000 was chosen for communities surveyed. It is recommended that survey teams consist of relatively small numbers of people working on a nearly full-time basis as field investigators.

67-1262

Muhich, A. J. National survey of community solid wastes practices. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. Conference Preprint No. A-8.

Work done on the National Survey by the Solid Wastes Program, in conjunction with State Planning grants authorized under the Solid Waste Disposal Act, is described. Forms and procedures for State solid waste surveys have been formulated and field tested in five States and the final data listings and reporting forms were developed. A dual approach was used in the survey forms. One data form (Community Description) was designed to gather general information on the storage, collection, and disposal of solid wastes in the 'community.' Two separate forms (Land Disposal Investigation and Facility Investigation) were also used. The 'community' form focuses on five broad information areas: community description, storage, collection, disposal, budget, and fiscal. The two disposal forms focus on community description, description and evaluation of site, quantitative data, and fiscal data. The Facility Investigation form contains a separate section on the design features and operational characteristics of incinerators.

67-1263

Orndorff, R. L. Regional solid waste disposal systems. _In_ Proceedings; Second Annual Meeting, Institute for Solid Wastes, Oct. 3-5, 1967. Chicago, American Public Works Association. p.9-25.

A brief description is given of five regional solid waste disposal systems. The Metropolitan Toronto Corporation, a federation of six municipalities, was given the refuse disposal function of picking up material remains in the jurisdiction of each of the members. The recommended plan for the area consists of construction work on three existing incinerators, new landfill sites, and six transfer stations with a capital expenditure estimated at $28,250,000, and annual operating costs ranging from $8,100,000 to $12,000,000. 'The California Integrated Solid Waste Management Project' deals with an intensive evaluation of a rapidly urbanizing area in the San Joaquin Valley. The objective of the study is to plan and design a regional solid waste system that will handle urban, industrial, and agricultural wastes, to test and evaluate the designed system and produce a methodology that can be generalized in regions other than Fresno county. Solid wastes systems analysis was carried out by the Quad City Solid Wastes Committee of Paterson, Clifton, Passaic, and Wayne, New Jersey. The formation of a Solid Waste Authority and an attempt at high temperature combustion are future objectives. Milwaukee County is proceeding with a program of solid wastes disposal which includes incineration, disposal area for bulky wastes, incinerator residues, and demolition material. The advantages of regional refuse disposal systems and studies of proposed regional solid wastes disposal systems in the Boston area and the Old Farms section of Connecticut are discussed.

67-1264

New solid wastes director is named. Compost Science, 7(3):14, Winter 1967.

Leo Weaver, a Public Health Service Sanitary Engineer Director, has been appointed Chief of the Solid Wastes Program. He succeeds Wesley E. Gilbertson.

67-1265

Omaha regional refuse disposal plant. Public Works, 98(7):130, July 1967.

The plans for a regional refuse disposal study covering the four-county Omaha metropolitan area are described. The study will require, develop, and provide information which should include: population and refuse quantities throughout the area (total and concentrations); a determination of the economical location of disposal sites; development of standard collection and disposal regulations for the counties and cities in the region; the legal establishment of disposal sites throughout the study area by zoning regulations, ordinances, statutes or other legal means; determination of locations for transfer stations, the use of compost plants, incinerators, sanitary landfills and other methods of waste disposal; a determination of methods and location of a disposal facility for automobile bodies and building debris; any other pertinent information.

67-1266

Pollock, E. L. Solid waste management. Refuse Removal Journal, 10(9):14, Sept. 1967.

The Refuse Removal Journal is now called the Solid Wastes Management/Refuse Removal Journal, thus reflecting the progressive steps taken by industry and government alike since the Journal first started publication in 1958. The words 'refuse removal' no longer accurately define the ever-widening scope of this periodical, so the publisher is beginning the first phase in the renaming of this trade magazine, which ultimately will be entitled Solid Wastes Management. Solid wastes management is a $3.3 billion industry, the fifth largest service activity in the United States.

67-1267

Public Health Office appoints new men. Refuse Removal Journal, 10(2):32, Feb. 1967.

Mr. De Von Bogue has been appointed Regional Program Director for Solid Wastes, Region IV, Atlanta, Georgia. Walter W. Liberich, Jr., will assist him.

67-1268

Regional test program. American City, 82(2):60, Feb. 1967.

In 1966 Aerojet General, under contract to make a study of waste management for the State of California, first employed systems analysis in their study of solid wastes. This came as a shock to many other corporations and individuals involved in similar studies. California then awarded Aerojet General an additional contract to develop an efficient solid waste disposal program for the 500,000 people living in the greater Fresno area (1,000 square miles). The Public Health Service granted Aerojet General $251,000 to complete the project. Aerojet General also acquired a $60,000 federal study contract to compile data concerning solid waste types, sources, and processes.

67-1269

Reid, P. M. The need for long-range planning for a solid waste disposal plan. In L. Weaver, ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. p.131-138.

History of the development of a regional solid waste disposal plan for the Detroit area is given. The administration is described. Information to establish the needs of a regional plan was obtained by a questionnaire and field survey. Recommendations of the advisory committee are given and steps taken to date to implement the plan are outlined. Most communities within the region had very short-range plans for solid waste disposal. The committee recommended a combined disposal system of incinerators and sanitary landfill sites.

67-1270

Sachsel, G. The management of solid wastes. Battelle Technical Review, 16(6):2, June 1967.

This editorial presents three ways to handle waste, change its geographical destination, its physical and chemical form, or our way of life. Changing the physical and chemical forms of waste is described as making them more amenable to recycling or restorage. Changing our way of life can reduce food and packaging waste. Technological advances allowing a given operation to be more economical and reliable are mentioned.

67-1271

Scornavacchi, M. T. How to plan a solid waste disposal program. Compost Science, 7(3):28, Winter 1967.

When planning a solid waste disposal program, engineers should evaluate the existing facilities: on premise storage, collection, and anticipated life, and do an economic study. They should establish actual refuse per capita figures. The type and quantity of salvageable refuse should be studied. Location and natural limitations should be considered.

67-1272

600-ton operation of Detroit areas. Refuse Removal Journal, 10(12):17, Dec. 1967.

The newly-formed Grosse Pointes-Clinton Refuse Disposal Authority has awarded $1,830,000 of incinerator bonds to a syndicate led by the Bank of the Commonwealth of Detroit. Proceeds of the bonds will be used to construct an incinerator plant with total capacity of 600 tons per day. The plant will be operated under a 25-year contract and will meet air pollution standards now in effect. Construction, which will cost about $1.5 million, is expected to begin shortly and take about a year. This Refuse Disposal Authority is the first such regional group in Michigan not dependent upon Federal or State funds.

67-1273

Spradlin, B. C. Solid waste management: a systems perspective. In American Public Works Association Yearbook 1967. Chicago, p.181-184.

Solid waste problems must be considered from a feedback systems perspective if effective programs for control of refuse generation and abatement are to be developed. Models relating to recognition of solid waste problems have been developed that incorporate regional planning effort and technology in a complex feedback systems manner. These models permit the design of system characteristics, such as planning effort allocation policies and research programs, so that the system is stimulated to take action toward system control. The portion of the system relating to problem recognition is shown in aggregate form. The composite system that surrounds the solid waste problem as it exists in a large metropolitan area is also illustrated. As the aggregated level of solid waste technology increases, source reduction capability increases and, after implementation, reduces the per capita production of solid waste. In feedback terminology, this is a negative feedback loop, that is, an increase in the per capita production of solid waste sets forth a chain of reactions that through the effects of feedback reduce the per capita production of waste. Much of the current thinking regarding the abatement of solid waste pollution reflects only the approach that the problem of solid waste generation lies beyond control and that solid waste pollution must be contained by disposal techniques alone.

67-1274

Summaries of papers presented at 2nd annual meeting of Institute for Solid Wastes. APWA Reporter, 34(12):11-12, Dec. 1967.

Papers presented at the 2nd Annual Meeting of the Institute for Solid Wastes are summarized. 'Los Angeles' Sanitation Management Information System' by Norman B. Hume describes the major factors taken into account in changing over from a manually compiled data system for refuse collection to an automated one. 'The California Integrated Solid Waste Management Project' by Paul P. Maier and Peter A. Rogers reviewed the study undertaken in the San Joaquin Valley to design an area-wide system of solid waste disposal. Frank P. Francis, in his paper on 'Regional Solid Waste Disposal Systems' described the evolution of planning for refuse collection and disposal from a 1961 survey by the cities of Paterson, Passaic, and Clifton to the formation of an ad hoc committee in 1966, representing those three cities plus Wayne. H. B. Wildschut presented a paper entitled 'Proposed Solid Waste Disposal System for Milwaukee County' and Frank L. Heaney, in his paper on 'Regional Solid Wastes Disposal Systems', noted the advantages of a regional disposal system. The importance of selecting equipment for a job was discussed by Don C. McClenahan in his paper 'Selection of Equipment for Refuse Collection Operations', and K. Wuhrmann used seven diagrams to illustrate his discussion of 'The Pros and Cons of Heat Recovery in Waste Incineration'. Three research projects being conducted by Elmer R. Kaiser are described in his paper 'Thermal Processes for Refuse Reduction' and, in his paper entitled 'Heil-Gondard Refuse Reduction Mill in Madison, Wisconsin,' Edwin J. Duszynski gave a progress report on the pilot plant study of the French-developed Gondard ballistic rejection hammermill. Three other papers applauded the programs and accomplishments of the U.S. Public Health Service in the field of solid wastes.

67-1275

Talty, J. T. Federal assistance available under the Solid Waste Disposal Act. Colorado Municipalities, 43(10):250-252, Oct. 1967.

The Secretary of Health, Education, and Welfare is responsible for waste problems of communities. The Secretary of Interior, through the Bureau of Mines, is responsible for mineral, metal, and fossil fuel waste problems. The Solid Wastes Program has a $12 million budget during fiscal year 1967, and a projected fiscal year 1968 budget of $15.6 million. The Program has initiated action in six areas: grant support for projects to demonstrate new and improved technology; grant support for area-wide solid waste management systems; grant support for State surveys of needs and development of plans; research to establish new approaches to management training programs; and technical assistance to local and State governments with solid waste problems. Objectives of a planning project include enacting and strengthening legislation, developing a data collection system, and setting and enforcing standards for design and operation of facilities. Grants provide up to 50 percent of costs. Approximately $1.5 million in grant funds have been awarded for the support of 32 State survey and planning projects.

67-1276

USPHS unit moves to Cincinnati; Vaughan replaces Weaver. APWA Reporter, 34(10):20, Oct. 1967.

The National Center for Urban and Industrial Health has established permanent headquarters in Cincinnati, Ohio. Establishment of the Center in Cincinnati brings together in one location numerous Public Health Service programs involving research, training, and technical and financial assistance in such environmental health fields as solid waste management, prevention of occupational illness, control of injury hazards, milk and food sanitation, health implications of the use of water and sea resources, and environmental engineering. One Center activity, the Arctic Health Research Laboratory, will continue to function at its new facility adjacent to the University of Alaska at Fairbanks. The Center is now located in rented facilities, but will eventually have permanent facilities on the campus of the University of Cincinnati. Director of the Center is Jerome Svore; Deputy Director is Paul W. Kabler; the Associate Director is Murray Brown; and the Assistant Director is Howard Kusnetz. Solid Wastes Chief will be Richard Vaughan; he replaces Leo Weaver, who will be attached to the Center's liaison office in Washington. Environmental Sanitation Chief will be Robert E. Novick. Water Supply and Sea Resources Chief will be Curtiss M. Everts. Injury Control Chief will be Richard E. Marland. Occupational Health Chief will be Murray C. Brown. Arctic Health Chief will be Edward Scott.

67-1277

U.S. study group reports on German solid waste management. APWA Reporter, 34(12):10, Dec. 1967.

In conjunction with the U.S.-German Cooperative Program in Natural Resources, Pollution Control, and Urban Development administered by the U.S. Department of Interior, a U.S. team examined solid wastes management in Germany. The Study Group came to several conclusions: (1) German domestic refuse is similar to American, but it contains more ash and fewer cans, bottles, and paper. (2) The principal storage container for German domestic use is a 100-liter refuse can. (3) The municipal government handles almost all domestic refuse collection, collecting from the curbside by means of mechanized lifting devices which must dump the containers 'dustlessly' due to the high ash content in the refuse. (4) No sanitary landfills exist; landfills have bad reputations similar to American ones. (5) Composting is practiced, but not extensively, because of high costs. (6) Efficient and well-engineered refuse incineration with the production of steam or electricity is common in Germany; however, refuse is not a 'free' fuel, as it costs more to produce steam or electricity from refuse than from conventional fuels.

67-1278

Vanderveld, J. Is private enterprise necessary? Refuse Removal Journal, 10(8):22, 40, Aug. 1967.

George Champion, Chairman of the Chase Manhattan Bank, said recently, 'I can think of nothing that would put the brakes on big government faster than for business to identify critical problems and take the initiative in dealing with them before Washington felt the need to act.' The State of Illinois established minimum rules and regulations for sanitary landfill operations in the State. The responsible contractor needs to have his equipment look clean and attractive. When raising collection rates, the contractor should write a letter of explanation. Job training is needed to teach the men on the trucks the fundamentals of equipment operation, safety, proper working habits, attitudes, and good public relations. The men are provided with uniforms, training, and fair-minded supervision. Private enterprise is more likely to get a full day's work for a full day's pay.

67-1279

Vogel, H. E. Meeting of the Swiss State Planning Commission. Wasser und Abwasser, 108(10):258-260, Mar. 10, 1967.

At a meeting of the Swiss State Planning Commission, H. P. Tschudi, chief of the Department of the Interior, pointed out that prior to World War II, economic, social, and cultural problems were handled primarily by local authorities. After the war, these tasks were shifted to the federal government, mainly because the towns and cantons lacked expertise and money; at the same time, and more importantly, national programs were promoted to meet the various needs. In contrast with the national highway programs and national educational programs, however, the tasks of water protection, waste disposal, and the establishment of sewage systems remained within the province of the towns, which now find the problem of coping with such tasks to be increasingly difficult. A commission of experts was set up to investigate the financial situation in the towns and cantons. It suggested that the following tasks should be performed jointly by Federal, canton and municipal governments: preservation of natural resources, maintenance of recreational areas, protection of water and air against pollution, waste disposal, and protection against noise.
(Text-German)

67-1280

Wathen, P. R., M. M. Clemmens, and W. Zabban. Three-way cooperation develops complete waste treatment system. Plant Engineering, 21(6):113-116, June 1967.

The results of three-way cooperation between plant engineer, consultant, and designer to solve waste disposal and water problems are discussed. The engineer had total responsibility for the overall program; the consultant supplied a detailed report describing the problems and the requirements as well as the cost. Plant location, the stream into which treated waste would be discharged, the use of the stream by others, the character of the water, and the effects the waste would have on the stream were points considered in planning. The activated sludge process chosen as the most economical and technically feasible means of removing organic material is explained. Equalization using ferrous sulfate minimized shock load and blending of waste constituents by preventing flow surge and assuring a more uniform waste concentration. Neutralization followed. Final disposal of solid waste at a sanitary landfill and liquid flow into the stream is described.

67-1281

Weaver appointed chief of solid wastes program. Refuse Removal Journal, 10(4):36, Apr. 1967.

Leo Weaver, a Public Health Service Sanitary Engineer Director with 10 years experience in solid wastes management, has been appointed Chief of the Solid Wastes Program to succeed Wesley E. Gilbertson. He will direct Federal participation in cooperative efforts with local and State governments and private organizations. Mr. Weaver was commissioned in 1948 following his graduation from New York University with a degree in civil engineering.

67-1282

Weaver, L., ed. Proceedings; the Surgeon General's Conference on Solid Waste Management for Metropolitan Washington, July 19-20, 1967. Public Health Service Publication No. 1729. Washington, U.S. Government Printing Office. 194 p.

The conference consisted of three panels. Panel A considered present practices and needs in the metropolitan area and papers were presented on: solid waste disposal for the Washington Metropolitan area; air pollution and solid waste disposal practices; solid waste handling by Federal installations; abandoned and scrap automobiles; and legislative needs for a metropolitan disposal program. Panel B discussed technology today and papers were presented on: transportation systems, land reclamation, refuse reduction processes, and recycling and utilization. Panel C covered development of a regional solid waste disposal plan and papers were presented on: the need for long range planning for a solid waste disposal plan; administrative aspects of area-wide planning; and, assistance available under the Solid Waste Disposal Act. A paper was also presented on health aspects of solid waste disposal. The proceedings volume also includes the open discussion following each of the panels; a summary of each of the panels, presented by the panel chairmen; and, keynote, luncheon and concluding addresses.

67-1283

Weaver, L. Solid Wastes; a new test for research and engineering. In Engineering Foundation Research Conference, Solid Waste Research and Development, University School, Milwaukee, July 24-28, 1967. (Keynote speech.)

Technological and sociological resources must be mobilized to increase knowledge of environmental systems and to apply present knowledge. The Solid Waste Disposal Act of 1965 can aid in this by utilizing the resources of local, State and Federal agencies and private organizations. The Federal government supplies resources for personnel training, statewide solid waste program planning, design of new area-wide management systems, demonstrations of new and improved technology, and research. The heart of the program is grant assistance and research.

67-1284

Welch, L. Utilization of advanced technology in urban governmental services. In Proceedings; Solid Waste in Urban Environments--a Community Action Seminar, Houston, Mar. 9, 1967. University of Houston. p.38-41.

A study made in 1964 indicated a per capita contribution of 2 lb of garbage per day in Houston, Texas. The city, as of one year ago, was serving 388,500 units with garbage pick-up. Residents who want to hire someone to pick up at their back door are reimbursed. Apartment projects have their own private pick-up. The City of Houston has disposed of its garbage and refuse for many years by the methods of sanitary landfill and incineration. Residents are fighting the establishment of sanitary landfills in some areas. Three incinerators are working, each with a capacity of 300 tons per day. A new incinerator will include modern pollution control equipment and will reduce the volume of garbage and refuse by 90 percent. The residue is ashes and noncombustible material, mainly in cans. It will operate around the clock, every day of the year, except for maintenance periods. The first 400-ton-per-day furnace is almost completed and a second 800-ton-per-day incinerator will be placed in operation within the next 2 years. The City has signed four separate contracts with four corporations for each of them to dispose of a minimum of 300 tons of garbage a day. Two corporations have completed composting plants. Complaints have been received from citizens in the area of one composting plant regarding odor. The plant also disposes of sewage sludge from the sewage treatment plant. If only one of the disposal systems results in a true success, the answer to the solid waste disposal problem may be solved.

67-1285

Zaltzman, R. Oklahoma City-County Health Department. Solid waste disposal countywide study; preliminary report. Oklahoma City, C. H. Guernsey & Co. Consulting Engineers, 1967. 69 p.

Means for optimizing the existing solid waste disposal systems in the Oklahoma City-County metropolitan area were studied. The major communities in Oklahoma County were sampled, a working model was developed and tested, and recommendations and cost estimates were made. The project plan attempted to: determine and solve the problems associated with waste collection; determine the best means for final waste disposal; and determine the economic viability of area-wide collection and disposal, as organized and operated within the existing legislation, and with or without the creation of new systems. The following were among the input data which were studied: the locations of the collection units and routes, the number of pickups per collection unit, the locations of the disposal facilities, and the locations of the overnight parking facilities for satellite vehicles. Then data were gathered concerning daily per capita refuse generation rates; refuse densities; and collection rates, both in terms of individual pickups and entire routes. With regard to improvement of the existing system, it was recommended that the following be studied in detail: cost estimates for sanitary landfills, refuse composition, cost analyses for refuse disposal, methods of disposal; milage analyses; and routes taken by disposal haulers.

67-1286

Zemlansky, J. Solid waste disposal will affect the future of urban land use. Public Health News, 48(9):203-204, Sept. 1967.

Disposal of the large amounts of refuse (12,600 tons of household refuse and 7,500 tons of industrial and commercial refuse from New Jersey and 1,000 tons from New York City and Philadelphia, daily) are discussed. A program to move New Jersey ahead in solid waste techniques has been launched with the help of a $50,000 grant from the U.S. Public Health Service. A training program at Rutgers University will triple the number of trainees in modern solid waste techniques. Additional personnel have been assigned to work with a reorganized solid waste disposal unit. An evaluation of sanitary landfills throughout the State was undertaken, detailing location, size, ownership, costs of collection and disposal, air pollution, odors, fire-control methods, etc. A similar study is being completed of incinerator facilities. Important factors in planning ahead, such as population changes, are considered. Further investigation must be made of the regionalization of solid waste disposal activities, leading to new and unique technological approaches.

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